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Regional Social Relationships Evaluation Using the AHP and Entropy Weight Method: A Case Study of the Qinghai–Tibet Plateau, China

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Abstract: The quality of social relationships is recognized as an important aspect of human well-being. Improving social relationships can help to promote other aspects of human well-being, such as health and income. The development of individual social relationships relies on regional social relationships. However, few studies have focused on social relationships evaluation at the regional level. Therefore, the study aims to construct a comprehensive evaluation index system and to evaluate regional social relationships by calculating the regional social relationships index (RSRI). The weights of the indicators were calculated by using the analytic hierarchy process (AHP) and entropy weight method. The social relationships of prefecture-level cities in the Qinghai–Tibet Plateau were evaluated based on statistical data. The results showed that (1) the top three indicators of comprehensive weight were number of community service agencies, number of vehicles operated on highway, and telephone penetration; (2) the regional social relationships on the Qinghai–Tibet Plateau showed an upward trend from 2010 to 2019; (3) the average RSRI scores of prefecture-level cities in Qinghai and Gansu were higher than other provinces; and (4) the number of community service agencies was the main obstacle factor for the development of regional social relationships in the Qinghai–Tibet Plateau. The finding of this study can provide further insights about social relationships research from a regional analysis perspective and cover the gap in the literature on regional social relationships.

Keywords: social relationships; AHP; entropy weight method; Qinghai–Tibet Plateau; China

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1. Introduction

Human well-being is a complex concept that contains subjective and objective factors [1]. It is one of the 17 Sustainable Development Goals (SDGs) [2]. Enhancing well-being for all is an approach to accelerating progress to achieve the SDGs [3]. The Millennium Ecosystem Assessment report of the United Nations Organization identified five interrelated constituents of human well-being: security, basic material for a good life, health, freedom and choice, and good social relationships [4]. Social relationships have been believed to be the main factor in happiness and have significant effects on well-being, especially subjective well-being [5,6]. On the one hand, social relationships have substantial and significant effects on life satisfaction; for instance, keeping in touch with friends can buffer older adults' loneliness [7–9]. On the other hand, social relationships can influence other aspects of well-being, such as health, income, and job choices [10–13]. These effects are especially pronounced in China [14,15]. Thus, this study examines the level of regional well-being in China from the perspective of "Good social relationships".

Sustainable development was identified as a major national strategy in China. Achieving the SDGs requires not only economic and environmental sustainability, but also social

sustainability [16]. The Qinghai–Tibet Plateau (QTP) is known as the "Roof of the World", with distinctive natural landscapes, unique cultural characteristics, and a special social background [17] Thus, the QTP is a key area for the construction of China's social sustainable development [18]. Our survey in the Yushu area of Qinghai and the Ganzi area of Sichuan from September 2020 to October 2020 found that, although the economic conditions of people in the Qinghai–Tibet Plateau are not very good, residents have a high sense of subjective well-being. One of the important reasons is that almost all of them have good social relationships. Social factors may predominate over economical determinants in the development of some regions [19]. There is no doubt that social relationships can improve social sustainability by promoting human well-being [20]. Thus, we expect to find some indicators to reflect the situation of social relationships at the regional scale of the Qinghai–Tibet Plateau.

There is no unified concept of social relationships, and scholars in different fields define social relationships according to their research needs [21,22]. However, the connection between people is recognized as the connotation of social relationships [23]. With the development of social relationships research, the evaluation of social relationships has developed from qualitative description to quantitative evaluation. At first, social relationships had been described as offering a sense of belonging, providing someone who can be trusted, or affecting perceptions of success in relationships [24]. Then, some indicators were used to characterize individual social relationships, such as family members, frequency of contact with friends, the number of good neighbors, married or not, and membership or not in social groups [25,26]. Additionally, the Social Relational Quality Scale (SRQS) has been used to measure individual social relationships [27]. However, a comprehensive index system has not been formed to evaluate social relationships, and few studies have focused on regional-scale social relationships. Referring to the regional analysis ideas of related research, regional social relationships can be defined as the infrastructure and support provided by regions for the development of good individual social relationships [28,29]. Regional social relationships can be understood as regional objective social relationships, which can be assessed using an indicator system, similar to objective well-being [30]. One of the advantages of using a unified index evaluation is that the study results can be used for comparison between different regions [31,32]. The study attempts to integrate indicators that can reflect regional social relationships and to construct the regional social relationships index (RSRI) to evaluate the objective social relationship in the study area.

Based on this, the purposes of this study were (1) to build a comprehensive regional social relationships index system; (2) to calculate the weight of each indicator for regional social relationships based on the analytic hierarchy method and entropy weight method; and (3) to evaluate the regional social relationships of prefecture-level cities on the Tibetan Plateau by calculating RSRI. Although evaluation methods may have imperfections, the findings of this study can provide a regional analysis perspective for future research on social relationships and can cover the gap in the literature on regional social relationships. Additionally, the evaluation index system for regional social relationships can provide support for better decisions considering regional development.

2. Methodology

2.1. Study Area and Data Collection

The Qinghai–Tibet Plateau is located in the southwest of China, between 37–39° N and 73–104° E (Figure 1). The total area of this district is 2,572,400 km^2, accounting for 26.8% of China's land area. The Qinghai–Tibet Plateau consists of Tibet and Qinghai, as well as some cities and countries in Gansu, Xinjiang, Yunnan, and Sichuan.

The statistical data of 37 prefecture-level cities in the Qinghai–Tibet Plateau (Table 1) from 2010 to 2019 were collected. The raw data of each indicator were from the China statistical yearbook for the regional economy, China city statistical yearbook, China civil affairs' statistical yearbook, statistical yearbook and statistical bulletin of provinces, autonomous regions, statistical yearbook, and statistical bulletin of relevant cities.

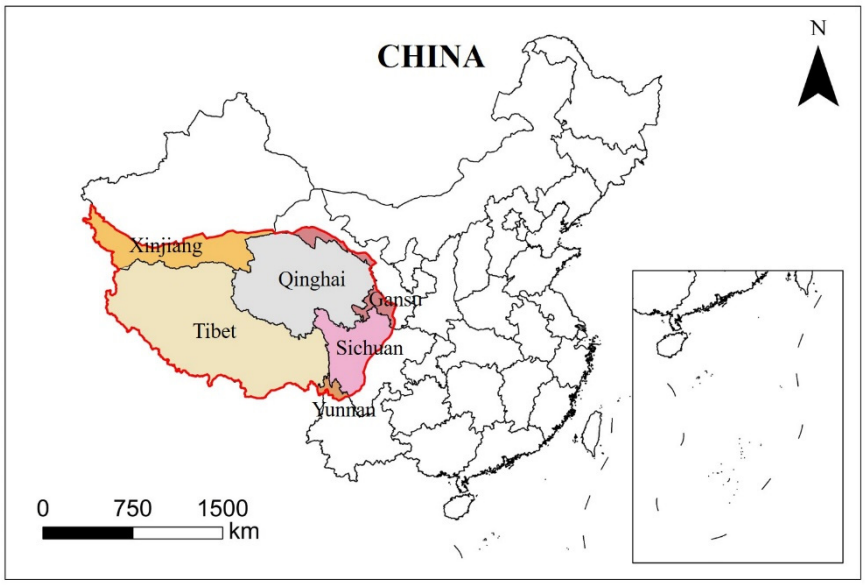


Figure 1. Location of Qinghai–Tibet Plateau in China.

Table 1. Thirty-seven prefecture-level cities in the Qinghai–Tibet Plateau.

Province	Prefecture-Level City
Tibet (7)	Lhasa (C1), Nagqu (C2), Qamdo (C3), Shannan (C4), Shigatse (C5), Ngari Prefecture (C6), and Nyingchi (C7)
Qinghai (8)	Xining (C8), Haidong (C9), Haibei Tibetan Autonomous Prefecture (C10), Huangnan Tibetan Autonomous Prefecture (C11), Hainan Tibetan Autonomous Prefecture (C12), Golog Tibetan Autonomous Prefecture (C13), Yushu Tibetan Autonomous Prefecture (C14), Haixi Mongolian, and Tibetan Autonomous Prefecture (C15)
Sichuan (6)	Ngawa Tibetan Qiang Autonomous Prefecture (C16), Ganzi Tibetan Autonomous Prefecture (C17), Liangshan Yi Autonomous Prefecture (C18), Mianyang (C19), Chengdu (C20), and Ya'an (21)
Yunnan (3)	Nujiang Lisu Autonomous Prefecture (C22), Diqing Tibetan Autonomous Prefecture (C23), Lijiang (C24)
Gansu (9)	Gannan Tibetan Autonomous Prefecture (C25), Wuwei (C26), Zhangye (C27), Linxia Hui Autonomous Prefecture (C28), Jiuquan (C29), Dingxi (C30), Longnan (C31), Jinchang (C32), and Tianshui (C33)
Xinjiang (4)	Bayangol Mongolian Autonomous Prefecture (C34), Hotan Prefecture (C35), Kashgar Prefecture (C36), and Kizilsu Kirghiz Autonomous Prefecture (C37)

2.2. The Principle of Indicator System Construction

Our measure of regional social relationships is an evaluative measure that may differ from emotional measures of individual social relationships [29]. According to the meaning of social relationships, the quantifiable indicators can be used to characterize regional social relationships in the study [33]. The construction of the whole index system followed the principles of scientificity, feasibility, and forward-looking. First, the indicators were to scientifically reflect the basic conditions and support that the region could provide for the development of individual social relationships. Second, the data involved in the evaluation index system were to be available, and the original data sources should be authoritative and credible. Third, the index system was to be easily developed from available data and could be applied at multiple scales [34,35]. The purpose of establishing regional social relationships index system was to evaluate whether a region provides support or help for the development of good social relationships. Therefore, the selected indicators could reflect

social relationships, such as the divorce rate, or could help to improve social relationships, such as the telephone penetration rate.

2.3. Indicator Selection of Regional Social Relationships

The indicators that we chose were from official published statistics related to the concept and connotation of the regional social relationships. Five dimensions were selected to reflect the regional social relationships. (a) Material Basis: According to a survey we conducted on the Qinghai–Tibet Plateau in September 2020, it was found that the development of social relationships required the support of communication and transportation equipment. For instance, the limitations of distance on interpersonal communication can be reduced by using transportation and communication devices. With modern methods of communication, the frequency of contact with friends increased, which has a positive effect on social relationships [36]. Thus, some indicators that can reflect the potential of individuals to communicate and connect were included initially, such as population density, civil car ownership, and telephone penetration. (b) Monetary expenditure: One of the principles of stabilizing social relationships is equality, which requires monetary expenditures as support. Studies have shown that material investment in communication is critical to the long-term stability of social relationships [37]. (c) Social security: It has been proven that education and health are closely linked to social relationships [10,38]. Such indicators reflecting the basis of regional medical care and education were selected. (d) Connection network: Participating in social groups can effectively enhance an individual's social circle [25]. In the study, social organization and public transportation were regarded as points and lines, respectively, and the points and lines were connected to form a social relationship network. (e) Harmony and stability: Harmony and stability can be used as one of the criteria to measure the quality of social relationships. For example, whether or not one is married is an important indicator for evaluating the individual's social relationships [25].

The study used SPSS software to perform a correlation analysis on initially selected indicators. Among the indicators with higher correlation coefficients, the more representative indicators were selected. The uncertainty in RSRI scores decreased as the number of indicators increased. Finally, 13 indicators were selected from 5 dimensions to construct a regional social relationship indicator system, as shown in Table 2.

Table 2. The regional social relationships index system.

Dimension	Code	Indicator (Code, Unit, Attribute)	Meaning
Material Basis	X_1	Telephone Penetration (per 100 people, +)	It reflects the communication potential of residents in the area.
	X_2	Civil Car Ownership (per 100 people, +)	It reflects the traffic travel potential of regional residents.
Monetary Expenditure	X_3	Transportation and Communication Expenditure (yuan/person, +)	It is used to characterize the intensity of transportation and communication expenditure for regional residents.
	X_4	Food, Tobacco, and Alcohol Expenditure (yuan/person, +)	It is used to characterize the intensity of food, tobacco, and alcohol expenditure for regional residents.
	X_5	Culture, Education, and Employment Expenditure (yuan/person, +)	It is used to characterize the intensity of culture, education, and employment expenditure for regional residents.

Table 2. *Cont.*

Dimension	Code	Indicator (Code, Unit, Attribute)	Meaning
Social Security	X_6	Number of Medical and Health Institutions (per 10,000 people, +)	It indicates the density of regional medical institutions.
	X_7	Pension Insurance Participation Rate (%, +)	It indicates the coverage of regional pension insurance.
Connection Network	X_8	Number of Community Service Agencies (per 10,000 people, +)	It characterizes the density of community service agencies.
	X_9	Number of Vehicles Operated on Highway (per 10,000 people, +)	It characterizes the regional public transportation capacity.
Harmony and Stability	X_{10}	Rural and Urban Income Ratio (%, +)	This indicator is used to evaluate regional urban–rural income differences.
	X_{11}	Rural and Urban Consumption Ratio (%, +)	This indicator is used to evaluate regional urban–rural consumption differences.
	X_{12}	Crude Divorce Rate (‰, −)	This indicator reflects the stability of households in the area.
	X_{13}	Urban Unemployment Rate (%, −)	This indicator is used to characterize the unemployment situation in the area.

2.4. Weight Calculation Method

In the comprehensive evaluation study, the calculation of the weight is very important, which directly affects the evaluation results. The methods used for determining the weight of indicators can be divided into the subjective method and the objective method. The subjective weight is generally determined by the expert scoring method. The objective weight is determined according to the impact of the indicator data on the overall data. The analytic hierarchy process (AHP) and the entropy method were used to determine indicator weights in this study.

2.4.1. AHP Method to Determine the Subjective Weight of Indicators

AHP is a method to decompose a complex problem into multiple elements, to build a hierarchical structure, and to compare the importance of indicators in pairs for each layer through an expert scoring method [39]. The basic steps are as follows:

(1) Construction of analysis hierarchy:

The hierarchy is generally divided into three layers, namely the target layer, the criterion layer, and the indicator layer [40]. This study took regional social relationships as the target layer, used the 5 dimensions of regional social relationships as the criterion layer, and the treated evaluation indicators as index layers.

(2) Construction of the regional social relationships evaluation judgment matrix

The judgment matrix is used to indicate the comparison of relative importance between each indicator in pairs in this layer. The scoring standard consisted of a 1–9 scale method to quantify the decision-making judgment (Table 3) [41].

$$A = \left(a_{ij}\right)_{n \times n} \quad (1)$$

Table 3. The 1–9 scale method.

Scale	Meaning
1	Indicates that two indictors are equally important.
3	Indicates that when the two indicators are compared, the former is slightly more important than the latter.
5	Indicates that when the two indicators are compared, the former is more important than the latter.
7	Indicates that when the two indicators are compared, the former is deeply more important than the latter.
9	Indicates that when the two indicators are compared, the former is extremely more important than the latter.
2,4,6,8	The comparison of the importance of the two indicators is between the above scales.
Reciprocal	If the comparison between the factors i and j is judged as a_{ij}, then the judgment of the comparison between the indicators j and i is $1/a_{ij}$.

In the formula, a_{ij} represents the relative importance between the index i and index j ($i = 1, 2, \ldots n$; $j = 1, 2, \ldots n$). Several focus group discussions (FGDs) were organized, where seven experts in related fields participated. First, to set the priority of elements within each indicator of the hierarchy, the experts were asked to assess each set of indicators in a pairwise fashion. Second, the discussions of indicators with an inconsistent relative importance were conducted. Finally, the relative importance of the indicators was determined.

(3) Consistency test of the judgment matrix

First, the consistency index (CI) is calculated by the following formula:

$$\mathrm{CI} = \frac{\lambda_{max} - n}{n - 1} \tag{2}$$

where λ_{max} represents the maximum characteristic root of the judgment matrix. Then, using the following formula calculate the random consistency ratio,

$$\mathrm{CR} = \frac{\mathrm{CI}}{\mathrm{RI}} \tag{3}$$

When CR is less than 0.1, the consistency of the judgment matrix is considered acceptable; otherwise, the judgment matrix needs to be adjusted. In the formula, RI represents the average random consistency index, which can be found in Table 4.

Table 4. Average random consistency index (RI).

n	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
RI	0	0	0.52	0.89	1.12	1.24	1.36	1.41	1.46	1.49	1.52	1.54	1.56	1.58

(4) Determination of the index subjective weight

The calculation of the index weight value can generally use the square root method, the sum–product method, the characteristic root method, the least square method, and other methods. This article uses the characteristic root method to calculate the index subjective weight. The formula is as follows:

$$AW = \lambda_{max} W \tag{4}$$

where A represents the judgment matrix, W represents the index subjective weight, and λ_{max} represents the maximum characteristic root of the judgment matrix. The subjective weight of each indicator (SW_j, j =1, 2, . . . , n) was determined according to the above formula.

2.4.2. Entropy Weight Method to Determine the Objective Weight of Indicators

The entropy weight method is an objective method of determining the weight of the indicator based on the information entropy of the original indicator data. Entropy is used to measure the disorder degree of a system. If a certain indicator contains more information, it means that the uncertainty is smaller, and the corresponding entropy is smaller. The indicator with a small entropy should have a large weight in the comprehensive evaluation. The specific steps are as follows:

(1) Standardization of indicator data:

Different types of data cannot be compared directly because they have multiple dimensions and magnitudes. Only by standardizing the data to ensure the equal status of all indicators could the data of all indicators be comparable. In this study, all indicators were divided into positive indicators and negative indicators.

The formula of the standardized method for the positive index is

$$X_{ij} = \frac{x_{ij} - min(x_j)}{max(x_j) - min(x_j)} (i = 1, 2, \ldots, m;\ j = 1, 2, \ldots, n) \quad (5)$$

The formula of the standardized method for the negative index is

$$X_{ij} = \frac{max(x_j) - x_{ij}}{max(x_j) - min(x_j)} (i = 1, 2, \ldots, m;\ j = 1, 2, \ldots, n) \quad (6)$$

where X_{ij} represents the value after the normalization of the i sample of the j index, x_{ij} represents the original value of the i sample of the j index, $max(x_j)$ represents the largest sample value among all samples for the j index, and $min(x_j)$ represents the smallest sample value among all samples for the j index. Each sample represents a prefecture-level city on the Qinghai–Tibet Plateau.

(2) Calculation index proportion:

The proportion of the value of the *i* sample for the j index is shown in the following equation:

$$Y_{ij} = \frac{X_{ij}}{\sum_{i=1}^{m} X_{ij}}. \quad (7)$$

where Y_{ij} represents the proportion of the i sample value under the j index.

(3) Calculation of index entropy:

The entropy calculation formula of each index is as follows:

$$E_j = -\frac{\sum_{i=1}^{m} (Y_{ij} \times lnY_{ij})}{lnm} \quad (8)$$

where E_j represents the entropy for each j index, and m represents the total number of the sample.

(4) Determination of the index objective weight:

The index weight calculation formula of each index is as follows:

$$W_j = \frac{1 - E_j}{\sum_{j=1}^{n} (1 - E_j)} \quad (9)$$

where W_j represents the weight for each j index, and n represents the total number of the index. The objective weight of each indicator (OW_j, j =1, 2, . . . , n) was determined according to the above formula. To unify the objective weight of each indicator in different years, we calculated the entropy value of each indicator from 2010 to 2019.

2.4.3. Determination of Comprehensive Weight

The calculation formula of the comprehensive weight of the regional social relationships index is as follows:

$$W_j = \frac{SW_j + OW_j}{2} \quad (10)$$

The value of W_j is between 0 and 1. The larger the W_j value, the larger the regional social relationships index weight. We hypothesized that both weights are equally important. The Equation (10) integrated SW_j and OW_j for the comprehensive weight (W_j) using arithmetic means.

The objective weights reflect the characteristics of the data, and the subjective weights reflect the consensus of experts on evaluations indicators [42,43]. To obtain the weight of each index more accurately, we adopted the combination of subjective and objective methods for calculating comprehensive weight, which can effectively avoid the errors caused by artificially determining the importance of each indicator and the influence of extreme values [44]. The weights of each index are listed in Table 5 from high to low according to the comprehensive weight. The three indicators with the top three weights were the number of community service agencies (X_8), number of vehicles operated on the highway (X_9), and telephone penetration (X_1).

Table 5. The weights of the regional social relationships indicators.

Indicators	Objective Weight	Subjective Weight	Comprehensive Weight
Number of Community Service Agencies (X_8)	0.241	0.080	0.160
Number of Vehicles Operated on Highway (X_9)	0.076	0.159	0.117
Telephone Penetration (X_1)	0.076	0.123	0.099
Crude Divorce Rate (X_{12})	0.030	0.151	0.090
Rural and Urban Consumption Ratio (X_{11})	0.069	0.081	0.075
Civil Car Ownership (X_2)	0.106	0.041	0.074
Transportation and Communication Expenditure (X_3)	0.069	0.078	0.073
Number of Medical and Health Institutions (X_6)	0.108	0.037	0.073
Pension Insurance Participation Rate (X_7)	0.052	0.075	0.063
Rural and Urban Income Ratio (X_{10})	0.027	0.073	0.050
Food, Tobacco, and Alcohol Expenditure (X_4)	0.076	0.024	0.050
Culture, Education, and Employment Expenditure (X_5)	0.051	0.043	0.047
Urban Unemployment Rate (X_{13})	0.020	0.036	0.028

2.5. Calculation of the Regional Social Relationships Index

According to the weight of each indicator and the standardized score of indicator data, the study calculated the regional social relationships index. The specific calculation formula is as follows:

$$\mathrm{RSRI}_i = \sum_{j=1}^{n} w_j X_{ij} \quad (11)$$

Among these, RSRI_i represents the regional social relationships index for the i sample, w_j represents the weight for the j indicator, and X_{ij} represents the value after the normalization of the i sample of the j index.

We conducted a sensitivity analysis to assess the sensitivities of RSRI scores to different values of indicators affecting RSRI scores [45]. The degree of sensitivity was assessed by a widely used formula.

$$S_j = \frac{\Delta Y / Y}{\Delta X_j / X_j} \quad (12)$$

where X_j is the value of a certain indicator under the original condition, and ΔX_j represents the difference in the value of a certain indicator between the original and modified conditions. Y represents the RSRI score under the original condition, and ΔY is the difference in RSRI scores between the original and modified conditions due to the changes in the value of a certain indicator. S_j represents the sensitivity index of the RSRI score to the j indicator. We increased and decreased, respectively, the value for each indicator by 10% for three randomly chosen cities (C7: Nyingchi, C14: Yushu, and C16: Ngawa) as examples and recalculated their RSRI scores and calculated the sensitivity index S_j. The sensitivity of RSRI scores to changes in data values of each indicator was less than 0.2 (Figure 2) [46].

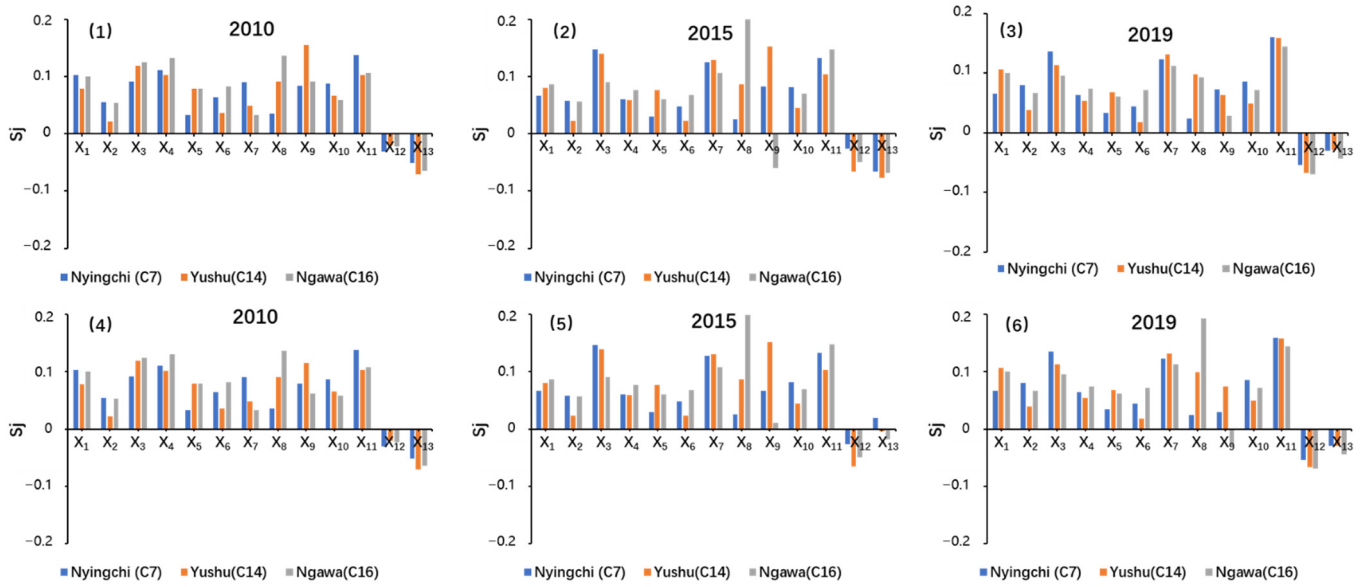


Figure 2. The sensitivity of RSRI scores to changes in each indicator. (1–3) showed the sensitivity index when each indicator's value increased by 10%; (4–6) showed the sensitivity index when each indicator's value decreased by 10%.

2.6. Diagnosis of Obstacle Factors

The obstacle model was used to calculate the obstacle factors of the regional social relationships index score for each province and autonomous region; the formula is as follows:

$$Q_{rj} = \frac{(1 - L_{rj}) * w_j}{\sum_{j=1}^{n} 1 - L_{rj} * w_j} * 100\% \quad (13)$$

where Q_{rj} represents the obstacle degree of the j index in the r province or autonomous region, L_{rj} represents the average score of the normalization of the j index for the r province or autonomous region from 2010 to 2019, and w_j represents the weight for the j indicator.

3. Results and Discussion

3.1. The Overall Characteristics of the RSRI

The comprehensive value of the regional social relationships index (RSRI) was calculated according to the weight of each indicator. Table 6 shows the evaluation results of RSRI, which range from 0 to 1. A high RSRI score indicates that the region provides more support and infrastructure for the development of individual social relationships. Among them, the average RSRI score of the Ganzi area (C17) was 0.496, ranking fifth among all 37 prefecture-level cities, which indicated that this area provides good support for the development of individual social relations. This is in line with our findings from the

survey that individual social relationships were good in this area. However, the interaction mechanism between regional social relationships and individual social relationships needs to be further researched.

Table 6. The 2010–2019 RSRI scores on prefecture-level cities.

Province	City Number	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Tibet	C1	0.358	0.449	0.485	0.512	0.516	0.518	0.522	0.547	0.553	0.530
	C2	0.228	0.320	0.354	0.356	0.382	0.392	0.372	0.409	0.414	0.381
	C3	0.251	0.313	0.345	0.377	0.356	0.374	0.385	0.397	0.396	0.375
	C4	0.294	0.364	0.394	0.421	0.413	0.451	0.420	0.397	0.441	0.418
	C5	0.254	0.316	0.363	0.368	0.368	0.364	0.378	0.411	0.405	0.384
	C6	0.280	0.336	0.391	0.399	0.410	0.417	0.447	0.470	0.467	0.443
	C7	0.372	0.408	0.447	0.458	0.464	0.490	0.500	0.535	0.516	0.494
Qinghai	C8	0.293	0.411	0.450	0.472	0.482	0.480	0.472	0.501	0.523	0.530
	C9	0.319	0.449	0.479	0.483	0.504	0.501	0.475	0.489	0.497	0.493
	C10	0.283	0.395	0.419	0.426	0.460	0.461	0.469	0.458	0.475	0.511
	C11	0.281	0.387	0.426	0.439	0.482	0.471	0.472	0.495	0.502	0.550
	C12	0.302	0.407	0.438	0.462	0.471	0.454	0.443	0.484	0.504	0.499
	C13	0.273	0.364	0.400	0.390	0.419	0.421	0.410	0.418	0.429	0.438
	C14	0.260	0.351	0.405	0.426	0.423	0.405	0.406	0.416	0.437	0.450
	C15	0.302	0.407	0.456	0.470	0.530	0.526	0.518	0.552	0.547	0.559
Sichuan	C16	0.329	0.427	0.455	0.467	0.471	0.479	0.479	0.491	0.508	0.503
	C17	0.405	0.459	0.479	0.508	0.505	0.509	0.503	0.514	0.541	0.541
	C18	0.341	0.388	0.417	0.414	0.420	0.430	0.429	0.428	0.440	0.448
	C19	0.316	0.356	0.356	0.358	0.365	0.374	0.418	0.429	0.450	0.454
	C20	0.387	0.441	0.473	0.464	0.476	0.477	0.476	0.471	0.479	0.487
	C21	0.295	0.345	0.378	0.395	0.401	0.391	0.405	0.411	0.420	0.441
Yunnan	C22	0.170	0.254	0.275	0.289	0.288	0.295	0.298	0.298	0.305	0.291
	C23	0.186	0.278	0.319	0.334	0.342	0.347	0.353	0.356	0.353	0.342
	C24	0.196	0.273	0.310	0.336	0.347	0.353	0.361	0.370	0.365	0.355
Gansu	C25	0.310	0.411	0.440	0.463	0.487	0.480	0.501	0.515	0.521	0.518
	C26	0.281	0.364	0.374	0.413	0.402	0.422	0.433	0.535	0.539	0.528
	C27	0.385	0.463	0.506	0.518	0.540	0.550	0.551	0.560	0.572	0.562
	C28	0.270	0.346	0.382	0.407	0.411	0.419	0.434	0.442	0.452	0.445
	C29	0.320	0.422	0.506	0.567	0.551	0.552	0.568	0.581	0.582	0.575
	C30	0.244	0.326	0.360	0.417	0.380	0.401	0.406	0.523	0.536	0.535
	C31	0.252	0.359	0.376	0.504	0.393	0.406	0.413	0.574	0.580	0.536
	C32	0.316	0.393	0.453	0.459	0.476	0.524	0.532	0.576	0.593	0.586
	C33	0.264	0.356	0.405	0.414	0.439	0.484	0.487	0.544	0.564	0.554
Xinjiang	C34	0.370	0.487	0.500	0.499	0.526	0.548	0.562	0.537	0.521	0.511
	C35	0.251	0.370	0.394	0.412	0.449	0.465	0.459	0.446	0.432	0.420
	C36	0.277	0.383	0.425	0.432	0.469	0.492	0.495	0.476	0.466	0.453
	C37	0.285	0.397	0.423	0.429	0.466	0.485	0.488	0.478	0.460	0.451

Figure 3 shows the trends of the regional social relationships index in the Qinghai–Tibet Plateau from 2010 to 2019. The mean score of prefecture-level cities increased from 0.292 in 2010 to 0.475 in 2019. Specifically, the average score of RSRI rose significantly from 2010 to 2013, and the trend was relatively stable after 2013. In addition, the scoring range of RSRI changed from 0.170–0.405 in 2010 to 0.291–0.586 in 2019. These results indicate that the overall regional social relationships in the Qinghai–Tibet Plateau show an upward trend. However, the regional differences between prefecture-level cities are expanding. This is consistent with previous studies demonstrating the imbalanced development problem for the sustainable development of the Qinghai–Tibet Plateau [17]. It can be seen from Table 6 that the RSRI scores of the prefecture-level cities in each province are similar, and the possible reason is that the development policies of each province are different. However, due to its unique environment and economy, the coordinated development of regions is more necessary in the Qinghai–Tibet Plateau.

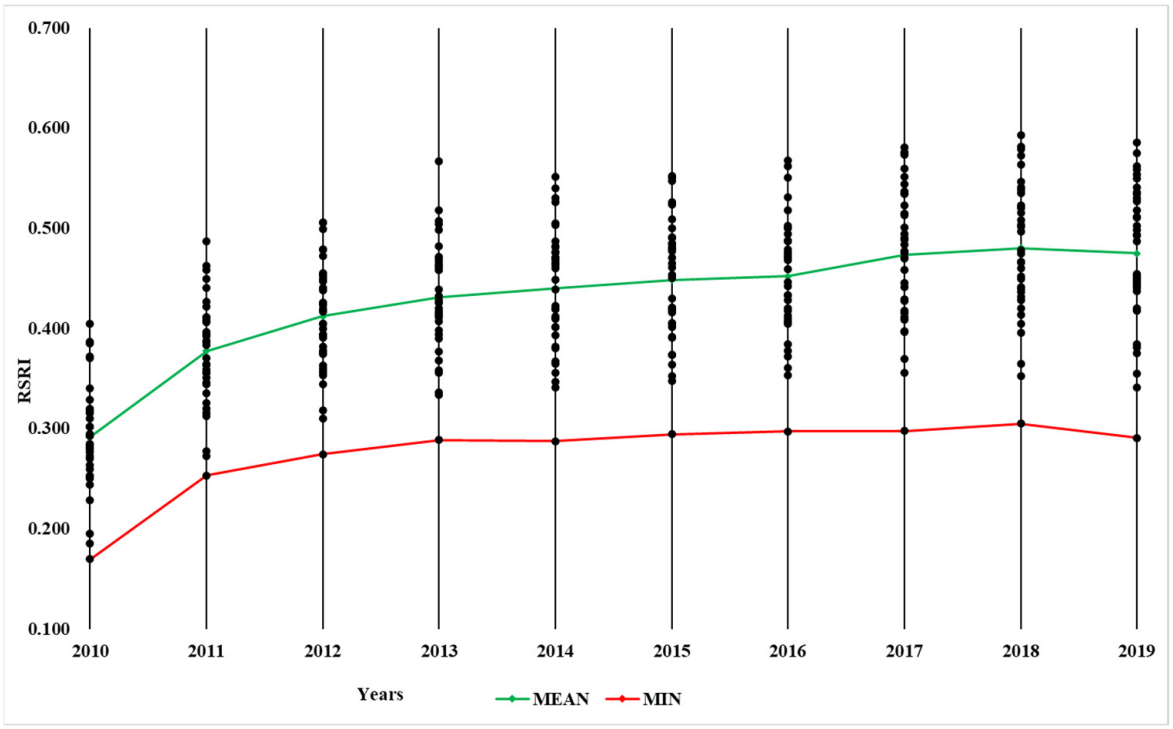


Figure 3. The distributions and changing trends of RSRI scores in the Qinghai–Tibet Plateau.

The comprehensive score of the regional social relationships index was divided into five levels: (0.15, 0.25)—low level (L1), (0.25, 0.35)—comparatively low level (L2), (0.35, 0.45)—intermediate level (L3), (0.45, 0.55)—comparatively high level (L4), and (0.55, 0.65)—high level (L5). The quantity distribution of each level for RSRI from 2010 to 2019 can be seen in Figure 4. Firstly, the regional social relationships developed rapidly between 2010 and 2013. There were five L1 areas and no L4-and-above areas in 2010. However, in 2011, the number of the lowest level areas dropped to zero, and three L4 areas appeared. The level with the largest proportion of the number had risen from L2 (70.3%) in 2010 to L3 (59.5%) in 2012. The L5 areas appeared for the first time in 2013, and the number of L4 and above areas accounted for 40.5%. Secondly, the regional social relationships rose steadily from 2013 to 2017. The number of the L1 and L2 areas decreased from three in 2013 to one in 2017. At the same time, the number of L4 and L5 regions increased from 15 to 23. Thirdly, there was no significant change in the quantitative distribution of each level for the regional social relationships index from 2017 to 2019. The possible reasons for this changing trend are as follows. In 2010, the regional social relationships index scores of most prefecture-level cities were at L1 or L2, and the overall development level of regional social relationships was low. At this stage, there is great potential for the development of regional social relationships. Therefore, the evaluation results may be affected significantly by the improvement of any indicator score. This effect will gradually weaken with the improvement of the overall level of the regional social relationships development due to the law of diminishing marginal effects. After that, the overall level of the regional social relationships is stable, and the development of that enters a bottleneck period. There is, therefore, an urgent need to improve relevant policies related to regional social relationships.

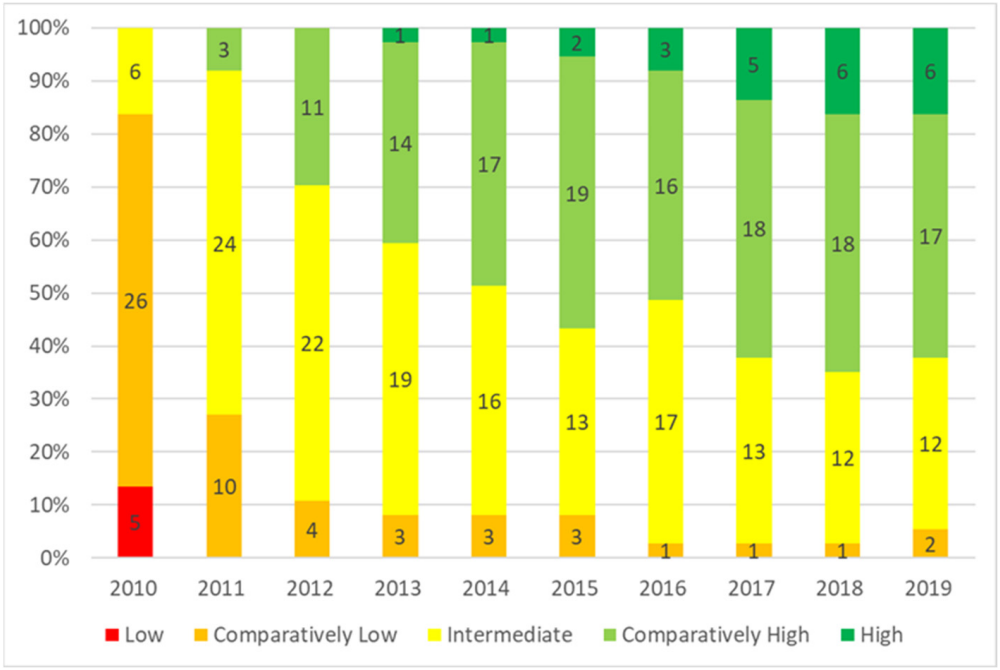


Figure 4. The quantities distribution of each level for RSRI in the Qinghai–Tibet Plateau.

3.2. The Regional Characteristics of the RSRI

Figure 5 shows the spatial distribution of the regional social relationships index in the prefecture-level cities on the Qinghai–Tibet Plateau in 2010, 2013, 2016, and 2019. In general, the regional social relationships in the Qinghai–Tibet Plateau region had improved significantly; the number of prefecture-level cities with "comparatively low" and "low" levels decreased; and the regional social relationships index scores had gradually developed to "comparatively high" and "high" levels. In terms of the result in Table 7 and Figure 5, the development level of regional social relationships in various provinces and autonomous regions could be summarized into the following three types: (1) High score and fast growth type, including Qinghai and Gansu. The average scores of Qinghai and Gansu for the regional social relationships index in 2019 were 0.504 and 0.538, respectively; compared with those in 2010, the growth rates were 74.24% and 83.14%, respectively. (2) Comparatively high score and moderate growth type, including Tibet and Xinjiang. In 2019, the average scores of the regional social relationships index of Tibet and Xinjiang were both around 0.45, which is approximately 50% higher than those in 2010. Among the seven prefecture-level cities in Tibet, only Lhasa and Nyingchi scored an L4 level on the regional social relationships index in 2019. In contrast, the difference in the regional social relationships index scores of different cities in Xinjiang was small. Of prefecture-level cities, 75% had reached the L4 level in the regional social relationships index scores. (3) Comparatively high score and slow growth type, including Sichuan. In 2010, the average score of Sichuan's social relationships index was the highest among the six provinces. However, by 2019, the average score of Sichuan was 0.479, with a growth rate (38.64%) the lowest among the six provinces. (4) Intermediate score and fast growth type, including Yunnan. In 2010 and 2019, the average scores of the regional social relationships index in Yunnan were 0.184 and 0.329, respectively, with a growth rate of 79.15%.

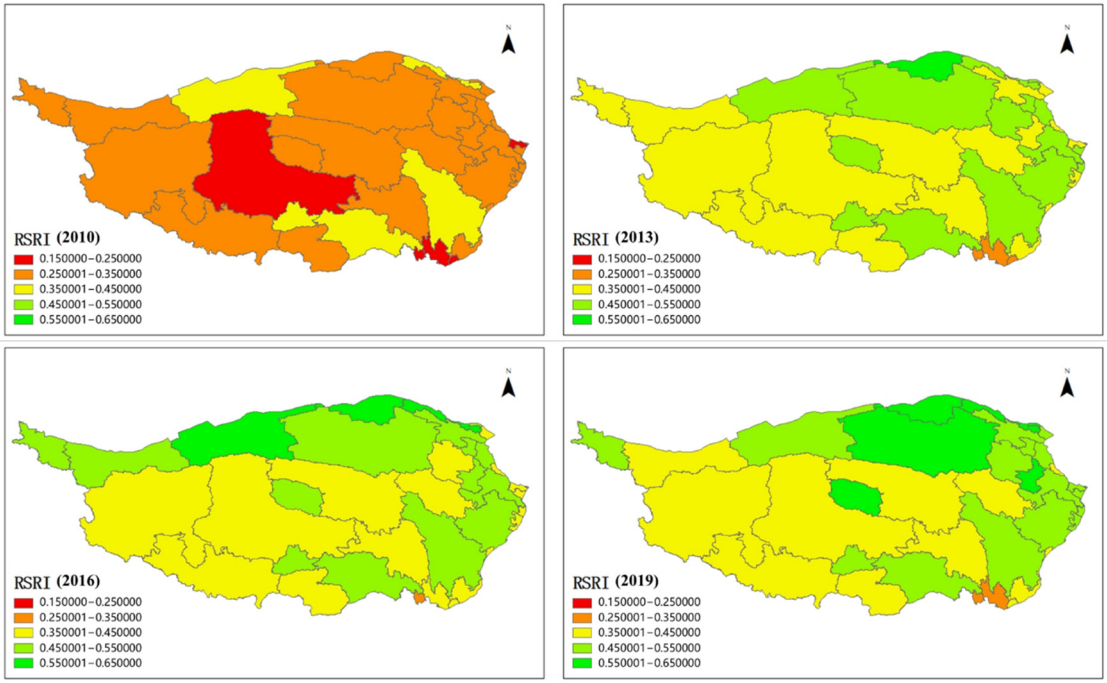


Figure 5. The regional social relationships index map in Qinghai–Tibet Plateau.

Table 7. The obstacle degree for RSRI in the provinces (%).

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}
Tibet	10.587	8.633	6.936	4.587	6.450	9.364	1.943	25.971	8.096	4.200	8.778	2.512	1.943
Qinghai	9.215	8.859	5.903	6.739	4.280	10.032	3.737	25.563	8.492	4.895	6.537	3.333	2.414
Sichuan	10.633	9.113	6.728	4.744	4.268	6.991	4.541	19.563	14.581	3.931	6.847	4.991	3.069
Yunnan	14.089	8.589	10.354	6.268	2.795	9.158	1.921	20.079	8.422	4.747	7.877	3.164	2.536
Gansu	10.409	10.543	8.739	6.676	4.063	6.306	7.310	16.693	11.714	4.460	7.422	3.037	2.628
Xinjiang	10.714	8.933	6.966	7.024	4.367	8.836	6.714	12.770	6.501	4.250	8.828	11.964	2.133

3.3. The Diagnosis of Obstacle Factors for Provincial RSRI

The main obstacle factors were identified using the criterion of an obstacle degree greater than or equal to 10% in the study. Table 7 shows the calculation results for the obstacle degree model. It can be found that Number of community service agencies (X_8) is the main obstacle factor to the development of regional social relationships for all provinces and autonomous regions. One possible reason for this result is that community relationships were the basic unit of regional social relationships. The community service agencies could promote the development of community relationships, which in turn promoted the development of regional social relationships. This also verified the rationality of the selection of indicators. Number of medical and health institutions (X_6) was another major obstacle factor to the development of regional social relationships in Qinghai. For other provinces and autonomous regions, Telephone penetration (X_1) was also one of the main obstacles to the development of regional social relationships. For Yunnan, which had the lowest score on the regional social relationships index, Telephone penetration (X_1), Transportation and communication expenditure (X_3), and Number of community service agencies (X_8) were the three major factors hindering the development of regional social relationships. Policies for developing regional social relationships can be formulated according to the obstacle factors of social relationships. For instance, the construction of the medical and health infrastructure could be strengthened to increase the coverage of medical and health institutions in Qinghai Province. Additionally, the development of

regional social relationships could be promoted through the construction of transportation and communication facilities in Yunnan Province.

4. Conclusions

This study established a comprehensive evaluation index system of regional social relationships, which consisted of five dimensions: material basis, monetary expenditure, social security, harmony and stability, and connection network. The content of these indicators reflected the basic conditions and support for building good social relationships in the regions. According to the statistical data from 2010 to 2019, the study calculated the indicator weights by using the analytic hierarchy process and the entropy weight method and evaluated the regional social relationships index of 37 prefecture-level cities on the Qinghai–Tibet Plateau. The conclusions are as follows:

(i) The top three indicators of comprehensive weight were Number of community service agencies (X_8), Number of vehicles operated on highway (X_9), and Telephone penetration (X_1), whose weights were 0.160, 0.117, and 0.099, respectively. Thereby, if the government wants to improve regional well-being by improving regional social relationships, it could pay more attention to the above three indicators when formulating policies.

(ii) At present, the overall development level of RSRI in Qinghai–Tibet was comparatively high and showed an upward trend from 2010 to 2019. The mean RSRI score of prefecture-level cities increased from 0.292 in 2010 to 0.475 in 2019. The number of areas rated "low" or "comparatively low" grades decreased from 31 in 2010 to 2 in 2019, and the number of areas rated "comparatively high" or "high" grades increased over the same period.

(iii) From the perspective of spatial distribution, the overall development level of RSRI in Qinghai and Gansu was higher than that in other provinces. The average RSRI scores of prefecture-level cities in Qinghai and Gansu were high and growing rapidly. The average RSRI scores of prefecture-level cities in Tibet, Sichuan, and Xinjiang were comparatively high. The RSRI scores of the three prefecture-level cities in Yunnan were relatively low; however, they increased significantly from 2010 to 2019.

(iv) Number of community service agencies (X_8) was the main obstacle factor to the development of regional social relationships in the Qinghai–Tibet Plateau. Community service agencies play an important intermediary role in the development of regional social relations. Thus, it would be wise to take community service agency building into account when designing regional development strategies. For example, during the COVID-19 pandemic, new neighborhood relationships should be developed based on community service agencies to improve residents' quality of life and happiness. The findings of the study can provide new ideas for policymakers in formulating regional development policies, especially in some areas with difficulties in economic development, which can improve local well-being by improving social relationships to achieve sustainable development.

Although some important findings were obtained, there may be some limitations of this study. While the evaluation method proposed in this study is a promising method for assessing the development of regional social relationships based on expert opinion and objective data, it has not been tested enough, and more empirical experience is needed. Further research is needed to verify the indicator system from multiple dimensions and to explore the interaction between regional social relationships and good individual social relationships.

Author Contributions: C.Z. and J.J. designed the study. All authors collected the data. C.Z. wrote the main manuscript text and collected and analyzed the data; J.J. supervised the manuscript and suggested revisions. All authors have read and agreed to the published version of the manuscript.

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References

1. Ryan, R.M.; Deci, E.L. On Happiness and Human Potentials: A Review of Research on Hedonic and Eudaimonic Well-Being. *Annu. Rev. Psychol.* **2001**, *52*, 141–166. [CrossRef] [PubMed]
2. UNGA. Transforming Our World: The 2030 Agenda Forsustainable Development. Available online: https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf (accessed on 16 March 2022).
3. Menne, B.; de Leon, E.A.; Bekker, M.; Mirzikashvili, N.; Morton, S.; Shriwise, A.; Tomson, G.; Vracko, P.; Wippel, C. Health and Well-Being for All: An Approach to Accelerating Progress to Achieve the Sustainable Development Goals (Sdgs) in Countries in the Who European Region. *Eur. J. Public Health* **2020**, *30*, 3–9. [CrossRef] [PubMed]
4. Reid, W.V.; Mooney, H.A.; Cropper, A.; Capistrano, D.; Carpenter, S.R.; Chopra, K. *Millennium Ecosystem Assessment. Ecosystems and Human Well-Being: Synthesis*; Island Press: Washington, DC, USA, 2005.
5. Goswami, H. Social Relationships and Children's Subjective Well-Being. *Soc. Indic. Res.* **2012**, *107*, 575–588. [CrossRef]
6. Han, J.; Kim, S.; Ha, S.E.; Shin, I.C. Ambivalent Effects of Social Relations on Subjective Well-Being. *Korean J. Sociol.* **2014**, *48*, 1–24. [CrossRef]
7. Headey, B.; Muffels, R.; Wagner, G.G. Choices Which Change Life Satisfaction: Similar Results for Australia, Britain and Germany. *Soc. Indic. Res.* **2013**, *112*, 725–748. [CrossRef]
8. Kearns, A.; Whitley, E.; Tannahill, C.; Ellaway, A. Loneliness, Social Relations and Health and Well-Being in Deprived Communities. *Psychol. Health Med.* **2015**, *20*, 332–344. [CrossRef]
9. Palmer, A.D.; Carder, P.C.; White, D.L.; Saunders, G.; Woo, H.; Graville, D.J.; Newsom, J.T. The Impact of Communication Impairments on the Social Relationships of Older Adults: Pathways to Psychological Well-Being. *J. Speech Lang. Hear. Res.* **2019**, *62*, 1–21. [CrossRef]
10. Lamu, A.N.; Olsen, J.A. The Relative Importance of Health, Income and Social Relations for Subjective Well-Being: An Integrative Analysis. *Soc. Sci. Med.* **2016**, *152*, 176–185. [CrossRef]
11. Macdonald, B.; Hulur, G. Well-Being and Loneliness in Swiss Older Adults During the COVID-19 Pandemic: The Role of Social Relationships. *Gerontologist* **2021**, *61*, 240–250. [CrossRef]
12. Andersen, L.M.B.; Rasmussen, A.N.; Reavley, N.J.; Bøggild, H.; Overgaard, C. The Social Route to Mental Health: A Systematic Review and Synthesis of Theories Linking Social Relationships to Mental Health to Inform Interventions. *SSM-Ment. Health* **2021**, *1*, 100042. [CrossRef]
13. Chen, Y. A Study on the Role of Guanxi in Entrepreneurship and Employment. *Econ. Model.* **2011**, *28*, 2049–2053. [CrossRef]
14. Chen, C.C.; Chen, X.P.; Huang, S.S. Chinese Guanxi: An Integrative Review and New Directions for Future Research. *Manag. Organ. Rev.* **2013**, *9*, 167–207. [CrossRef]
15. Bian, Y. The Prevalence and the Increasing Significance of Guanxi. *China Q.* **2018**, *235*, 597–621. [CrossRef]
16. Afshari, H.; Agnihotri, S.; Searcy, C.; Jaber, M.Y. Social Sustainability Indicators: A Comprehensive Review with Application in the Energy Sector. *Sustain. Prod. Consum.* **2022**, *31*, 263–286. [CrossRef]
17. Zhao, Y.; Chen, D.; Fan, J. Sustainable Development Problems and Countermeasures: A Case Study of the Qinghai-Tibet Plateau. *Geogr. Sustain.* **2020**, *1*, 275–283. [CrossRef]
18. Wang, X.; Huang, X.; Zhang, X.; Yan, Y.; Zhou, C.; Zhou, J.; Feng, X. Analysis of the Spatio-Temporal Change of Social-Ecological System Coupling: A Case Study in the Qinghai-Tibet Plateau. *Glob. Ecol. Conserv.* **2022**, *33*, e1973. [CrossRef]
19. Torres, P.C.; Morsello, C.; Parry, L.; Pardini, R. Forest Cover and Social Relations are More Important than Economic Factors in Driving Hunting and Bushmeat Consumption in Post-Frontier Amazonia. *Biol. Conserv.* **2021**, *253*, 108823. [CrossRef]
20. Munzel, A.; Meyer-Waarden, L.; Galan, J.P. The Social Side of Sustainability: Well-Being as a Driver and an Outcome of Social Relationships and Interactions on Social Networking Sites. *Technol. Forecast. Soc.* **2018**, *130*, 14–27. [CrossRef]
21. Cai, J.; Walkling, R.A.; Yang, K. The Price of Street Friends: Social Networks, Informed Trading, and Shareholder Costs. *J. Financ. Quant. Anal.* **2016**, *51*, 801–837. [CrossRef]
22. Pi, T.; Cao, L.W.; Lv, P.; Ye, Z.L.; Wang, H. Inferring Implicit Social Ties in Mobile Social Networks. In Proceedings of the 2018 IEEE Wireless Communications and Networking Conference, Barcelona, Spain, 15–18 April 2018; IEEE: New York, NY, USA, 2018.
23. Bian, Y. The Comparative Significance of Guanxi. *Manag. Organ. Rev.* **2017**, *13*, 261–267. [CrossRef]
24. Lansford, J.E.; Antonucci, T.C.; Akiyama, H.; Takahashi, K. A Quantitative and Qualitative Approach to Social Relationships and Well-Being in the United States and Japan. *J. Comp. Fam. Stud.* **2005**, *36*, 1–13. [CrossRef]
25. Yang, M.S.; Burr, J.A. Combat Exposure, Social Relationships, and Subjective Well-Being Among Middle-Aged and Older Veterans. *Aging Ment. Health* **2016**, *20*, 637–646. [CrossRef] [PubMed]

26. Abunge, C.; Coulthard, S.; Daw, T.M. Connecting Marine Ecosystem Services to Human Well-Being: Insights from Participatory Well-Being Assessment in Kenya. *Ambio* **2013**, *42*, 1010–1021. [CrossRef] [PubMed]
27. Hou, W.K.; Lam, W.; Law, C.C.; Fu, Y.T.; Fielding, R. Measuring Social Relational Quality in Colorectal Cancer: The Social Relational Quality Scale (Srqs). *Psycho-Oncology* **2009**, *18*, 1097–1105. [CrossRef]
28. Falkenmark, M. Water and Human Livelihood Resilience: A Regional-to-Global Outlook. *Int. J. Water Resour. Dev.* **2016**, *33*, 181–197. [CrossRef]
29. De Neve, J.E.; Sachs, J.D. The Sdgs and Human Well-Being: A Global Analysis of Synergies, Trade-Offs, and Regional Differences. *Sci. Rep.* **2020**, *10*, 15113. [CrossRef]
30. Wang, S.; Luo, Y.; Han, Y.; Li, J. Regional Difference and Determinats of Human Well-Being in China: Based on the Analysis of Human Development Index. *Prog. Geogr.* **2018**, *37*, 1150–1158. (In Chinese)
31. Wang, W.; Jin, J.; He, R.; Gong, H.; Tian, Y. Farmers' Willingness to Pay for Health Risk Reductions of Pesticide Use in China: A Contingent Valuation Study. *Int. J. Environ. Res. Public Health* **2018**, *15*, 625. [CrossRef]
32. Jimenez Jimenez, F.; Munoz Mazon, A.I.; Fuentes Moraleda, L. Evaluation of Well-Being in Tourist Destinations. How to Apply the Human Development Index. The Case of Tapijulapa, Magic Town, Mexico. *Investig. Tur.* **2021**, *21*, 86–105. [CrossRef]
33. Peng, H.; Duysters, G.; Sadowski, B. The Changing Role of Guanxi in Influencing the Development of Entrepreneurial Companies: A Case Study of the Emergence of Pharmaceutical Companies in China. *Int. Entrep. Manag. J.* **2016**, *12*, 215–258. [CrossRef]
34. Smith, C.L.; Clay, P.M. Measuring Subjective and Objective Well-Being: Analyses from Five Marine Commercial Fisheries. *Hum. Organ.* **2010**, *69*, 158–168. [CrossRef]
35. Wang, X.; Chen, X. An Evaluation Index System of China's Development Level of Ecological Civilization. *Sustainability* **2019**, *11*, 2270. [CrossRef]
36. Hu, X.; Kim, A.; Siwek, N.; Wilder, D. The Facebook Paradox: Effects of Facebooking on Individuals' Social Relationships and Psychological Well-Being. *Front. Psychol.* **2017**, *8*, 87. [CrossRef] [PubMed]
37. Fiske, A.P. The 4 Elementary Forms of Sociality—Framework for a Unified Theory of Social-Relations. *Psychol. Rev.* **1992**, *99*, 689–723. [CrossRef] [PubMed]
38. Ge, X.; Xu, J.; Zheng, N. Analysis and Empirical Research on the Influence of the Accompanying Education on the Social Relations in Urban and Rural Families. *Educ. Sci. Theory Pract.* **2018**, *18*, 3368–3375.
39. Chen, Y.; Yu, J.; Khan, S. The Spatial Framework for Weight Sensitivity Analysis in Ahp-Based Multi-Criteria Decision Making. *Environ. Model. Softw.* **2013**, *48*, 129–140. [CrossRef]
40. Saaty, T.L. Axiomatic Foundation of the Analytic Hierarchy Process. *Manag. Sci.* **1986**, *32*, 841–855. [CrossRef]
41. Zhang, Y. Construction of Bid Evaluation Index System in Government Public Project Green Procurement in China Based On D-S Evidence Theory. *Sustainability* **2020**, *12*, 651. [CrossRef]
42. Veisi, H.; Deihimfard, R.; Shahmohammadi, A.; Hydarzadeh, Y. Application of the Analytic Hierarchy Process (Ahp) in a Multi-Criteria Selection of Agricultural Irrigation Systems. *Agric. Water Manag.* **2022**, *267*, 107619. [CrossRef]
43. Zhong, C.; Yang, Q.; Liang, J.; Ma, H. Fuzzy Comprehensive Evaluation with Ahp and Entropy Methods and Health Risk Assessment of Groundwater in Yinchuan Basin, Northwest China. *Environ. Res.* **2022**, *204*, 111956. [CrossRef]
44. Wang, X.; Zhang, S.; Liu, L. Fuzzy Comprehensive Evaluation of Water Environmental Carrying Capacity Based on Ahp-Entropy Method. *Environ. Sci. Technol.* **2021**, *44*, 206–212.
45. Plumper, T.; Traunmuller, R. The Sensitivity of Sensitivity Analysis. *Political Sci. Res. Methods* **2020**, *8*, 149–159. [CrossRef]
46. Xu, Z.C.; Chau, S.N.; Chen, X.Z.; Zhang, J.; Li, Y.J.; Dietz, T.; Wang, J.Y.; Winkler, J.A.; Fan, F.; Huang, B.R.; et al. Assessing Progress towards Sustainable Development over Space and Time. *Nature* **2020**, *577*, 74. [CrossRef] [PubMed]