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Research on Cultural Inheritance of Tibetan, Qiang and Yi Characteristics in Sustainable Development Design of Urban Residential Buildings and High Quality Development of Resource Cities

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Abstract This paper systematically describes the sustainable development design of urban residential buildings and summarizes the basic principles and design concepts. Under the guidance of evaluation index system, 18 evaluation indexes are selected to form a coupling index system of Tibetan, Qiang and Yi culture and residential building development. Comprehensive entropy weight method and coupling coordination method form the coupling model of Tibetan, Qiang and Yi culture and residential building, in addition to determining the data sources, and using the model to assess the cultural heritage of Tibetan, Qiang and Yi characteristics and the level of development of urban residential building. 2013, the coupling coordination between the two is located in the range of 0.1~0.2, which indicates that the coupling level is located in the extremely dysfunctional recession, and at the same time, reveals the difficulties faced by the two, and in order to improve their development, proposes In order to improve their development, two targeted coupling development strategies are proposed to promote the synergistic development of the two.

Index Terms entropy power method, coupling coordination method, urban residential architecture, Tibetan, Qiang and Yi specialty culture, sustainable development

I. Introduction

With the rapid development of China's economy and the improvement of people's living standards, China's urban residential construction has been developing rapidly and its position in the national economy has increased significantly, first of all because it is related to the immediate interests of the people. As the world's largest developing country, China has greatly improved people's living conditions in the last 20 years, supported by strong growth in economic development [1], [2]. The per capita residential area has increased several times. It is this huge amount of construction work and extraordinary speed of construction that has led to various problems while meeting the basic housing needs and solving the problem of having or not having housing. Disorderly development, waste of resources, environmental pollution and ecological damage and other problems. It is worth noting that after 20 years of rapid development, especially the shortage of energy, river pollution and other serious conditions, people have a more direct understanding of the concept of sustainable development, and the pain of the pain of the skin to arouse people's conscience. Sustainable development has become an inevitable trend of history [3]-[6].

The sustainable development of urban residential buildings is in line with the direction of China's current stage of development, in line with the current Chinese emphasis on the scientific concept of development to lead the economic development, and take the road of sustainable development of the ideological approach to comprehensively promote the ecological, economical and environmentally friendly sustainable development of residential buildings has a positive significance for the realization of China's goal of sustainable development [7]-[9]. Sustainable residential refers to the premise of ensuring the function and comfort of residential, in the process of planning, design, development, construction, all, maintenance of the whole life, adhere to the development and sustainability, respect for the natural ecology, minimize the consumption of resources such as energy, land, water and materials, and as far as possible, the recycling of resources [10], [11]. Fully achieve resource conservation and recycling, respect the overall coordination of the city, respect the principle of fairness and justice, as long as this can realize the current proposed scientific concept of development, the sustainable development of the actual residential buildings, in order to protect the earth's homeland where people live with patience, so the sustainable

development of the urban residential building design has an important practical significance and far-reaching historical significance [12]-[14].

The Tibetan, Qiang and Yi characteristic cultures mainly include the Tibetan, Qiang and Yi Corridor, which is blessed with a natural ecological environment and a long history of humanistic deposits. It is rich in folk culture resources, mainly Tibetan culture, Qiang culture, history and culture, regional culture, red culture constitute five characteristics of culture, which not only reflects the unique ethnic customs, but also demonstrates the cultural intermingling of the multi-ethnic family, but also flaunts the various ethnic groups to live in harmony, and strive for strength and generosity [15]-[17]. With the rapid development of the regional economy, cultural resources will eventually be depleted, resource exhaustion of resource cities, how to continue the cultural pulse, how to activate the renewal of resource cities withered heart, how to successfully transform can be more motivated and passionate about sustainable development [18], [19]? Based on the above issues, the joint mechanism between the cultural heritage of Tibetan, Qiang and Yi characteristics and the high-quality development of resource cities can be explored from the perspective of the sustainable development design of urban residential buildings, in order to help guide the cultural transformation of resource cities, to shape and improve the cultural wholeness of resource cities, and to play a vital role in the sustainable development of urban residential buildings [20]-[23].

The cultural heritage of Tibetan, Qiang and Yi characteristics and the high quality of urban residential architecture as mutually independent systems are not explored separately along the traditional method, but are discussed by the entropy power method and the coupling coordination method, so that the structure of the article is full of innovativeness, and the basic principles and design concepts are extended through the in-depth interpretation of the design of sustainable development of urban residential architecture. Under the requirement of the principle of evaluation index system construction, the coupling index system of Tibetan, Qiang and Yi culture and residential building development is finally determined, which is mainly composed of 2 subsystems and 18 evaluation indexes. The coupling coordination degree method and entropy weight method are adopted to complete the construction of the coupling evaluation model of Tibetan, Qiang and Yi culture and residential building, taking a city as the object of the study, and at the same time selecting the data source, with the help of the model, the level of integration and development of Tibetan, Qiang and Yi culture and residential building is assessed and analyzed in an all-round way, and the corresponding coupling development strategy is proposed.

II. Research on Tibetan, Qiang and Yi cultural heritage and development of resource-oriented cities

II. A. Sustainable design of urban residential buildings

II. A. 1) Basic principles

The basic principles of sustainable housing design are conservation, ecology, humanization, harmlessness and intensification.

Although there has been a consensus on the design guidelines, policies and basic principles followed by architecture, the standards of practice and the content involved are still improved with the development of society and the times, from the earliest "solid, practical and beautiful" to today's "architecture, people, and environment", the objects considered by architecture have developed greatly in both breadth and depth. The relevance of social humanities and engineering science and technology in architecture and the question of their scope boundaries are also classic topics. This is because architecture has the attributes of humanities and engineering sciences, and at the same time has distinct national and regional characteristics. "Beautiful, hygienic and safe" can be called sustainable architecture.

The new concept of development (the concept of sustainable development) requires us to establish a new view of architecture - the concept of sustainable architecture, the concept of eco-architecture, and our practical action is to move towards the respect for natural architecture, change the human-centeredness, as little as possible to harm the earth, towards intensive design, the construction industry must move from the rough to intensive, and advocate the design of high efficiency, economy, and technology, to open architecture, architecture is an organic active system, in order to adapt to environmental changes must have variable adaptive system, the building will be more humane and more ecological. Toward open architecture, architecture is an organic active system, in order to adapt to environmental changes, must have variable adaptive system, toward interdisciplinary architectural design, the building will be more humanized, more ecological. The conception and creation of architectural design should be based on the four aspects of “material environment, ecological environment, social environment and artistic environment”, and the intention of “respecting nature and returning to nature” should be set up on the ideology of architectural design, especially considering the interrelationship between architecture and climate, architecture and environment, utilizing its favorable factors to prevent or improve its unfavorable factors, and creating healthy and

beautiful buildings. Building and the environment of the interrelationship, the use of its favorable factors, to prevent or improve its unfavorable factors, to create a healthy and beautiful building.

In economization, due to the urban population, resources, environmental contradictions are increasingly prominent, in order to save energy, many countries in the world set off the development and utilization of renewable energy boom, such as solar energy, wind energy, geothermal heat, etc., it is worth mentioning in particular is the application of solar energy in the building has a very clear development prospects, the development and utilization of solar energy has become an important part of the countries to formulate a strategy of sustainable development, now the solar energy The use of technology in research and development, commercial production, market development has been a significant development, renewable energy in the world energy structure will account for more than 50%, and gradually become one of the basic energy of mankind.

In terms of ecology and humanization, the ancient people created and believe in many theories of the relationship between human beings and nature, and today's sustainable development theory coincides with, and many are still in use, there are many sustainable building practices in traditional architecture can be drawn on, from the traditional culture of sustainable development ideas and practices, the development of sustainable architecture is very useful.

II. A. 2) Design concept

Modern sustainable housing requires diversified design concepts, and the design should be comprehensively and systematically analyzed in terms of ecology, architecture, resources, water, environment, materials, landscape, energy, economy and other factors.

(1) Comprehensive environmental concept.

(2) Diversified spatial concept.

(3) Enhance the concept of architectural culture.

(4) The concept of energy saving (using natural energy, wind energy, light energy, ground source as much as possible).

(5) Comprehensive economic efficiency concept.

Residential building for people to provide living space “container”, as a natural ecosystem of resource consumers, and the needs of the user, should reflect a healthy, harmonious, full of vitality of the situation. In order to achieve this goal, we can use the following means.

(1) Adjuster of indoor and outdoor environment.

(a) The entry garden is a buffer zone located at the entrance of each house, where plants can be planted to effectively improve the microclimate. In excessive season, it is an open space to keep indoor and outdoor air circulation. In summer, the transparent louvered sunshade system of the entry garden can effectively shield the direct sunlight, and become an excessive space to take a good buffer effect on the indoor space without affecting the air flow as much as possible.

(b) overhead roof, in the summer for the thermal buffer effect of the roof is particularly obvious, in addition to the erection of solar panels, but also can make full use of the sun's radiant energy and shade direct sunlight, through the air flow of the overhead layer, but also can quickly take away the heat, reduce the surface temperature of the roof.

(2) The use of natural energy strategies solar energy as a kind of clear-cut green energy, its application has a very broad prospect, solar collector panels can provide primary heat source for air-conditioning system, at the same time, solar energy can become the hot water system heat.

(3) Healthy and harmless strategy

(a) Natural ventilation, the biggest benefit of this practice is to save energy and avoid air virus cross infection.

(b) Greening is introduced into the entry garden, when we introduce vegetation and greening, not only for the consideration of energy saving, but also in pursuit of a life that stays close to nature.

(c) Harmlessness of materials, the relationship between building materials and user's health is an important topic of green design nowadays.

Eco-architecture has aroused great interest among architects and developers. Whether it is public buildings or residential neighborhoods, architects have to introduce measures in line with eco-architecture to achieve the purpose of energy saving, water saving, waste reduction and pollutant emission reduction.

II. B.Coupled Indicator System of Tibetan, Qiang and Yi Culture and Residential Building Development

Based on the theoretical analysis of the sustainable development design of urban residential buildings above, the integration of Tibetan, Qiang and Yi culture and urban development has both unique development advantages and unavoidable problems. Therefore, this section compares the existing research methods and combines the actual situation of culture and urban residential design, Tibetan, Qiang and Yi culture and sustainable development of

urban residential building design to construct a reasonable index model to measure the level of integration of culture and sustainable development of urban residential building design in the 11 core cities and states of Tibet, Qiang and Yi.

II. B. 1) Principles of construction

The Tibetan, Qiang and Yi distinctive culture system and the urban residential building development system are respectively huge and complicated systems, so the representative research results are sorted out and studied. Combined with the realistic purpose of the study, the evaluation index system of Tibetan, Qiang and Yi special culture and urban residential building development is constructed according to different principles.

(1) Scientific principle

The design of the evaluation index system and the selection of evaluation indexes must adhere to the principle of scientificity, the evaluation index system should be comprehensive, and the relevant indexes should be able to truly and objectively reflect the protection of traditional village culture and the natural, economic and social development situation. In addition, the selected evaluation indicators should be typical, and the overlap between the indicators should be avoided.

(2) Principle of flexibility

Since the natural, economic, social and cultural data at the residential level are more difficult to obtain, especially those about nature and culture, the principle of flexibility should be adopted to solve the problem of difficulty in obtaining the indicators in the actual selection of indicators, such as the data of natural categories can be obtained through the means of geographic information technology. Indicator data on the state of cultural protection and inheritance can be assigned scientifically and subjectively on the basis of on-site research and field exploration.

(3) Principle of operability

The coupling index system of Tibetan, Qiang and Yi distinctive culture and urban residential building development should adopt the evaluation method with strong operability and wide scope of application, and in the selection of indexes, it should try to choose the indexes that are easy to be judged, and for the indexes that can not be directly measured, it should be replaced by indirect and accessible indexes according to the indexes' meaning, so as to build a scientific and appropriate evaluation system.

II. B. 2) System of evaluation indicators

Table 1 shows the coupling index system of Tibetan-Qiang-Yi characteristic culture and urban residential building development. The subsystem of sustainable development of urban housing includes 9 evaluation indicators (ecological environment coordination degree A1, living suitability A2, spatial coordination degree A3, water resource richness A4, per capita annual income A5, economic benefit A6, business richness A7, collective income A8, material saving and green building materials A9), while the Tibetan-Qiang-Yi characteristic cultural inheritance subsystem also contains 9 evaluation indicators (proportion of historical buildings B1, richness of historical environmental elements B2, protection of major cultural relics B3, protection of traditional streets and alleys B4, The inheritance degree of traditional folk activities is B5, the richness of intangible culture is B6, the level of cultural inheritance is B7, the vitality of traditional folk activities is B8, and the influence of township rules and people's covenants is B9).

Table 1: Coupled index system

Target layer	Criterion layer	Symbol
Residential development subsystem	Ecological environment coordination degree	A1
	Living fitness	A2
	Spatial coordination degree	A3
	Water resource abundance	A4
	Per capita annual income	A5
	Economic benefit	A6
	Format richness	A7
	Collective income	A8
	Saving materials and green building materials	A9
Cultural inheritance subsystem	The proportion of historical buildings	B1
	Richness of historical environmental elements	B2
	Degree of protection of major cultural relics	B3
	Traditional street protection degree	B4
	Heritage of traditional folk activities	B5
	Intangible cultural richness	B6

	Hierarchy of cultural inheritance	B7
	Traditional folk activities vigorous	B8
	Village rules and conventions influence	B9

II. C. Coupling Model of Tibetan, Qiang and Yi Culture and Residential Architecture

With the widespread popularization of the concept of integration, the phenomenon of integration has been emerging in major fields, which makes more and more field boundaries become no longer clear, and at the same time, it also makes the concepts and scope of activities of various field disciplines change, and this change has caused a large number of scholars to study and pay attention to the effect of integration. In this subsection, the coupling coordination degree method will be used to construct a coupling evaluation model of Tibetan, Qiang and Yi culture and residential architecture.

II. C. 1) Weight calculation based on entropy weight method

(1) Standardization of data

Due to the different data units of the indicators selected for the study, in order to facilitate the substitution of the relevant model measurements, the data need to be dimensionless, the formula is as follows:

$$x_{ij}^{'} = \frac{x_{ij} - x_{min}}{x_{max} - x_{min}} + 0.001 \tag{1}$$

where, $i = 1, 2, \cdots, m$ indicates the year order, $j = 1, 2, \cdots, n$ indicates the number of indicators, $x_{\max}$ is the maximum value of the j th indicator, and $x_{\min}$ is the minimum value of the j th indicator [24]-[26]. And 0.001 is added at the end of the standardized formula to ensure the validity of the results.

(2) Determine the weights of indicators

The entropy value method is used to assign weights to the standardized data in order to place each indicator system in the same research category. The formula is as follows:

$$s_{ij} = x_{ij}^{'} / \sum_{i=1}^{m} x_{ij}^{'} \tag{2}$$

$$h_j = -\frac{1}{\ln m} \sum_{i=1}^{m} s_{ij} \ln s_{ij} \tag{3}$$

$$\alpha_j = 1 - h_j \tag{4}$$

$$w_j = \alpha_j / \sum_{j=1}^{n} \alpha_j \tag{5}$$

II. C. 2) Evaluation of the level of integrated development

The comprehensive development level evaluation model reflects the actual development status of the project within a certain period of time by assigning weights to the indicators within a specific period of time and multiplying them with the standardized values of the corresponding indicators.

(1) The evaluation formula for the comprehensive development level of the Tibetan, Qiang and Yi cultural heritage program is as follows:

$$F(x) = \sum_{j=1}^{n} w_j M_{ij} \tag{6}$$

where, j indicates the number of evaluation indexes of development level of Tibetan, Qiang and Yi cultural heritage project $(j = 1, 2, \cdots, n)$; w_j indicates the weight of each index; M_{ij} indicates the standardized value of the j th index of Tibetan, Qiang and Yi cultural heritage project in the i th year; $F(x)$ indicates the index of comprehensive development level of Tibetan, Qiang and Yi cultural heritage project, and the bigger the result indicates that the comprehensive development level of the Tibetan, Qiang and Yi cultural heritage project is better, and vice versa, the worse it is.

(2) Evaluation of comprehensive development level of urban residential building design projects

$$G(y) = \sum_{i=1}^{n} w_j N_{ij} \tag{7}$$

where, j indicates the number of indicators for evaluating the level of development of urban residential building design projects $(j=1,2,\cdots,n)$. w_j indicates the weight of each indicator. N_{ij} represents the standardized value of the j th indicator of urban residential building design projects in the i th year, and $G(y)$ represents the index of the comprehensive development level of urban residential building design projects. Similarly, the larger the result, the better the comprehensive development level of urban residential building design projects in the region, otherwise, the worse the development level of urban residential building design projects.

II. C. 3) Calculation of the degree of coupling coordination

The coupling degree mainly judges the degree of association between various different systems, which can more accurately reflect the integration development trend of regional culture and urban residential building design projects [27], [28]. In order to empirically study the integration development between Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects, the coupling coordination degree evaluation model is introduced, and its formula is as follows:

$$C=2\sqrt{F(x)G(y)/[(F(x)+G(y))(F(x)+G(y)r)]} \tag{8}$$

$$T=\alpha F(x)+\beta G(y) \tag{9}$$

$$D(F(x),G(y))=\sqrt{CT} \tag{10}$$

In the above formula, $F(x)$ and $G(y)$ represent the comprehensive development level of the Tibetan, Qiang and Yi cultural heritage program and the urban residential building design program respectively, and the coupling degree between the two systems of the Tibetan, Qiang and Yi cultural heritage program and the urban residential building design program is C, with a value between 0 and 1, and the size of the coupling degree value is directly proportional to the degree of coupling between the systems. However, it is found that the coupling degree model may not be able to accurately reflect the development level of Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects which are in dynamic change, and there may be an unreasonable situation in which the coupling degree of both of them is high and the index of comprehensive development level is low. Therefore, we adopt the adjusted coupling degree model to more accurately measure the integration and development level between culture and urban residential building design projects, see formula (10), T is the comprehensive coordination index between the two, D is the coupling degree of coordination between the two, α,β is the importance coefficient, due to the Tibetan, Qiang, and Yi cultural heritage projects and urban residential building design projects for the economy of the basic contribution to the same, so the study takes $\alpha=\beta=0.5$.

II. C. 4) 2.3.4 Evaluation of the relative degree of development

On the basis of measuring and analyzing the coupling coordination degree of Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects in the 11 core cities and states of the Tibetan, Qiang and Yi Corridor in 2015-2021, in order to further compare the relative development between Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects, the relative development evaluation model is used to analyze the relative development type and characteristics of Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects. The relative development type and characteristics of the Tibetan, Qiang and Yi cultural heritage project and the urban residential building design project are analyzed to evaluate the integration and development of the two more objectively. The formula is as follows:

$$E=F(x)/G(y) \tag{11}$$

In equation (11), E indicates the relative development degree of the Tibetan, Qiang and Yi cultural heritage project and the urban residential building design project, and $F(x),G(y)$ is the comprehensive development level index of the Tibetan, Qiang and Yi cultural heritage project and the urban residential building design project calculated according to the comprehensive development level evaluation model, respectively.

III. Evaluation and strategy for the integration of Tibetan, Qiang and Yi cultures with residential architecture

III. A. Data sources, standardization, and weight calculation

III. A. 1) Data sources

This paper selects a certain city as the object of this research, and mainly uses the panel statistics of a certain city. All the data involved in this paper come from the Statistical Yearbook of a City (2013-2020), the Statistical Yearbook

of a City (2019), the Statistical Yearbook of a City (2020), and the Statistical Bulletin of a city government and the governments of districts and counties in the relevant years, respectively.

III. A. 2) Standardized processing

The panel statistics of each indicator from 2013 to 2020 are shown in Table 2. As can be seen from Table 2, the value of indicator A1 shows a decreasing trend from 2013 to 2014, and then has a warming trend in 2015, and then has a serious downward trend in performance from 2015 to 2017, and then falls to the lowest point in 2017, and then starts to grow again from 2017 to 2019, and is in a dynamic equilibrium from 2019 to 2020, and the rest of 17 indicators will not be expressed in detail, and will be based on the table of the data as the basis.

Table 2: Panel statistics of each indicator from 2013 to 2020

Index	2013	2014	2015	2016	2017	2018	2019	2020
A1	5.818	4.061	5.661	2.315	1.08	6.471	9.647	9.445
A2	9.769	4.126	6.33	8.561	6.802	3.253	5.54	3.96
A3	6.669	5.448	3.971	5.479	5.713	4.955	2.74	4.029
A4	4.628	8.009	3.417	2.99	7.541	6.615	2.054	4.66
A5	8.637	6.99	5.538	2.41	1.432	3.578	9.437	2.846
A6	2.231	3.787	4.327	5.087	9.652	9.965	9.853	2.612
A7	7.309	4.888	6.533	8.048	7.344	1.017	3.105	1.421
A8	8.701	5.766	8.062	7.084	3.094	8.35	3.483	2.586
A9	9.25	8.298	9.191	8.708	6.942	3.392	7.984	8.007
B1	9.907	2.114	3.711	1.524	7.248	2.325	3.263	8.857
B2	7.638	9.855	1.619	5.099	2.576	6.499	4.277	7.028
B3	1.588	9.403	7.33	5.514	9.984	2.633	6.221	2.797
B4	8.353	3.879	1.52	1.086	7.976	8.737	8.806	5.624
B5	6.071	4.425	2.259	5.445	9.091	6.676	2.19	1.791
B6	5.483	4.807	5.617	3.201	2.318	1.807	7.584	4.329
B7	7.868	3.496	4.194	6.147	8.223	9.722	6.936	5.067
B8	5.093	1.156	2.735	2.445	3.359	9.522	8.905	1.836
B9	8.777	8.644	8.399	4.006	2.169	6.925	8.868	7.202

According to the above formula (1), the data in Table 2 are standardized, and the standardized data are shown in Table 3. By standardizing the data, data support is provided for the subsequent calculation of indicator weights.

Table 3: Standardized data

Index	2013	2014	2015	2016	2017	2018	2019	2020
A1	0.554	0.349	0.536	0.145	0.001	0.630	1.001	0.977
A2	1.001	0.135	0.473	0.816	0.546	0.001	0.352	0.110
A3	1.001	0.690	0.314	0.698	0.758	0.565	0.001	0.329
A4	0.433	1.001	0.230	0.158	0.922	0.767	0.001	0.439
A5	0.901	0.695	0.514	0.123	0.001	0.269	1.001	0.178
A6	0.001	0.202	0.272	0.370	0.961	1.001	0.987	0.050
A7	0.896	0.552	0.786	1.001	0.901	0.001	0.298	0.058
A8	1.001	0.521	0.897	0.737	0.084	0.944	0.148	0.001
A9	1.001	0.838	0.991	0.908	0.607	0.001	0.785	0.789
B1	1.001	0.071	0.262	0.001	0.684	0.097	0.208	0.876
B2	0.732	1.001	0.001	0.424	0.117	0.594	0.324	0.658
B3	0.001	0.932	0.685	0.469	1.001	0.125	0.553	0.145
B4	0.942	0.363	0.057	0.001	0.893	0.992	1.001	0.589
B5	0.587	0.362	0.065	0.502	1.001	0.670	0.056	0.001
B6	0.637	0.520	0.661	0.242	0.089	0.001	1.001	0.438
B7	0.703	0.001	0.113	0.427	0.760	1.001	0.554	0.253
B8	0.472	0.001	0.190	0.155	0.264	1.001	0.927	0.082
B9	0.987	0.968	0.931	0.275	0.001	0.711	1.001	0.752

III. A. 3) Calculation of weighting results

Calculate the entropy value, coefficient of variation and weight of each indicator in accordance with the above formulas (2) to (5), using the data of year A1 as the basis for calculation:

The sum of the standardized treatment of indicator A1 for 8 years from 2013 to 2020:

S=0.554+0.349+……+0.977=4.194

Characteristic specific gravity calculation:

$s_{ij} = 0.554 / 4.194 = 0.132$

Calculate $\ln(s_{ij})$ and $s_{ij}\ln(s_{ij})$ separately:

$\ln(s_{ij}) = -2.024$

$s_{ij}\ln(s_{ij}) = -0.267$

The sum of $s_{ij}\ln(s_{ij})$ for the 8-year period from 2013 to 2020:

-0.267+(-0.207)+……+(-0.339)=-1.822

Calculate the entropy value of indicator A1:

$h_j = [(-1)\ln(8)] * 1.822 = 0.876$

Calculate the coefficient of variation for indicator A1:

$a_j = 1 - h_j = 0.124$

Calculate the sum of the coefficients of variation for each indicator:

0.124+0.163+……+0.090=2.572

Calculate weight w_j for indicator A1:

$w_j = 0.124 / 2.572 = 0.048$

The process of calculating the entropy value, coefficient of variation and weight of each indicator is the same as above, and the results of calculating the entropy value, coefficient of variation and weight are shown in Table 4. From the table, it can be seen that among the weight values of all indicators, the weight of indicator B1 (0.085) has the largest value, followed by indicator B8 (0.081), indicator A6 (0.076) again, and the weights of the remaining 15 indicators are all less than 0.07.

Table 4: Entropy, difference coefficient and weight calculation results

Index	Entropy value	Coefficient of difference	Weight
A1	0.876	0.124	0.048
A2	0.837	0.163	0.064
A3	0.904	0.096	0.037
A4	0.860	0.140	0.054
A5	0.838	0.162	0.063
A6	0.804	0.196	0.076
A7	0.856	0.144	0.056
A8	0.840	0.160	0.062
A9	0.931	0.069	0.027
B1	0.781	0.219	0.085
B2	0.873	0.127	0.049
B3	0.847	0.153	0.059
B4	0.859	0.141	0.055
B5	0.897	0.103	0.040
B6	0.860	0.140	0.055
B7	0.864	0.136	0.053
B8	0.791	0.209	0.081
B9	0.910	0.090	0.035

III. B. Comprehensive development index and coupling harmonization analysis

III. B. 1) Comprehensive development index analysis

According to formula (6) to (7), the comprehensive development index of Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects are calculated respectively, and the results of the analysis of the comprehensive development index are shown in Table 5. Taking the comprehensive development index of urban residential building design in 2013 as an example, the specific calculation process is as follows:

$$G(y) = \sum_{i=1}^{n} w_j N_{ij}$$

$$= 0.048 \times 0.132 + 0.0187 \times 0.292 + \cdots + 0.169 \times 0.027 = 0.0849$$

It can be seen that the comprehensive development index of urban residential building design projects during the period of 2013~2020 declined from the initial 0.0849 to 0.0304, reflecting the current difficulties faced by urban

residential building design projects. And the cultural heritage of Tibetan, Qiang and Yi culture during the period of 2013~2019 decreases from 0.0925 to 0.0630 in the base period, with a decrease of 0.0295, which is less problematic compared to the urban residential building design projects.

Table 5: Results of comprehensive development index analysis

Year	2013	2014	2015	2016	2017	2018	2019	2020
Urban residential building design	0.0849	0.0601	0.0621	0.0616	0.0634	0.0604	0.0641	0.0304
Tibetan-qiang Yi culture inheritance	0.0925	0.0533	0.0486	0.0309	0.0649	0.0679	0.0953	0.0630

III. B. 2) Calculation of the degree of coupling coordination

The coupling coordination degree of Tibetan, Qiang and Yi cultural heritage project and urban residential building design project is calculated by using the formula (8) to (10) respectively, and the results of the coupling coordination degree calculation are shown in Table 6. Taking the calculation of the coupling coordination degree of Tibetan, Qiang and Yi cultural heritage project and urban residential building design project in 2013 as an example, the detailed calculation process is shown as follows:

$$C = 2\sqrt{F(x)G(y)/[(F(x)+G(y))(F(x)+G(y)r)]}$$

$$=2\sqrt{0.0849\times 0.0925/[(0.0849+0.0925)(0.0849+0.0925)]}$$

$$=0.499541$$

$$T=\alpha F(x)+\beta G(y)=0.5\times 0.0849+0.5\times 0.0925=0.0887$$

$$D(F(x),G(y))=\sqrt{0.499541\times 0.0887}=0.210498$$

The coupling coordination degree is divided into the following criteria, 0~0.1 for extreme dysfunctional recession class, 0.1~0.2 for severe dysfunctional recession class, 0.2~0.3 for moderate dysfunctional recession class, 0.3~0.4 for mild dysfunctional recession class, 0.4~0.5 for endangered dysfunctional recession class, 0.5~0.6 for endangered dysfunctional recession class, 0.6~0.7 for primary coupling coordination class, 0.7~0.8 for intermediate coupling and coordination category, 0.8~0.9 for good coupling and coordination category, and 0.9~1.0 for quality coupling and coordination category. It can be seen that the coupling coordination degree of Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects in 2013 was extremely dysfunctional and recessionary, and the coupling coordination degree between the two in 2014~2020 was severely dysfunctional and recessionary, which fully reveals the current situation of the high-quality development of the Tibetan, Qiang and Yi distinctive cultural heritage and urban residential building design in the city from 2013 to 2020.

Table 6: The calculation result of coupling coordination degree

Year	2013	2014	2015	2016	2017	2018	2019	2020
C	0.499541	0.4991	0.496268	0.471659	0.499966	0.499145	0.490329	0.468555
T	0.0887	0.0567	0.05535	0.04625	0.06415	0.06415	0.0797	0.0467
D	0.210498	0.168223	0.165736	0.147696	0.179089	0.178942	0.197685	0.147924

III. C. Results of the relative degree of development assessment

With the help of the above formula (11) to analyze the relative development degree of Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects, the relative development degree assessment results are shown in Table 7, also take the calculation of the relative development degree of Tibetan, Qiang and Yi cultural heritage projects and urban residential building design projects in 2013 as an example, and the detailed calculation process is shown below:

$$E=F(x)/G(y)=0.0849/0.0925=0.9178$$

The result of the relative development degree of the Tibetan, Qiang and Yi cultural heritage program and the urban residential building design program in 2013 was 0.917, indicating that the development level of the Tibetan, Qiang and Yi cultural heritage in that year was better than the development level of the urban residential building design program, and the other analyses in the years from 2014 to 2020 are described similarly.

Table 7: Results of relative development assessment

Year	2013	2014	2015	2016	2017	2018	2019	2020
Urban residential building design	0.0849	0.0601	0.0621	0.0616	0.0634	0.0604	0.0641	0.0304
Tibetan-qiang Yi culture inheritance	0.0925	0.0533	0.0486	0.0309	0.0649	0.0679	0.0953	0.0630
Relative development degree	0.9178	1.1276	1.27778	1.99353	0.97689	0.88954	0.67261	0.4825

III. D. Coupling Development Strategy

With the development of building technology and the improvement of building material level, the architectural residential design has been developed in the long run, but the characteristic culture of the building has been gradually lost, how to be able to combine the characteristic culture of the building and the architectural residential design has become a problem that architects need to be solved urgently at present. For this reason, the following article mainly focuses on the specific strategies for the coupling of architectural residential design and characteristic culture, hoping to promote the development of architectural residential design and Tibetan, Qiang and Yi characteristic culture.

III. D. 1) Highlighting regional culture

Culture is the root of architecture, in the architectural residential design should intentionally start from highlighting the regional culture, promote the integration of regional culture and architectural residential design, show the customs and habits of different regions, moral sentiments, religious beliefs. Designers should be able to integrate the regional cultural characteristics, combine the unique local cultural characteristics, overcome their own stereotyped thinking, conceive a new world from the regional culture, perseverance and research, so as to design buildings in line with the characteristics of Tibetan, Qiang and Yi.

III. D. 2) Highlighting history and culture

History and culture are also very important in residential architectural design, different regions have different historical and cultural characteristics, the ability to combine historical culture and architecture in architectural residential design, reflecting the style of a region is also a source of inspiration for designers. If designers can combine architectural culture and history, use architecture to reflect the development of history, reflect different historical and cultural cohesion of architectural art, combine architecture and history and culture, can also bring different design styles for architectural residential design.

IV. Conclusion

In this paper, under the design concept of sustainable development of urban residential buildings and the principle of index system construction, the relative evaluation index system is determined, and the entropy weight method and the coupling coordination degree method are used to jointly construct a model of coupling between Tibetan, Qiang and Yi culture and residential buildings. The data sources are selected, and the initial data and model are combined to explore the current situation of coupling Tibetan, Qiang and Yi culture with residential buildings. It is calculated that the coupling class of Tibetan, Qiang and Yi culture and residential building during 2013~2020 is degree of dysfunctional recession class and serious dysfunctional recession class, and its specific coupling coordination degree is 0~0.3. For the situation of this class, the coupling strategy is put forward from the aspects of regional culture and history and culture, and it promotes the synergistic development of Qiang and Yi characteristic cultural inheritance and resource-oriented city.

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