Knowledge Maps Analysis of Research on settlement Landscape of Qiang based on the Citespace Method

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Abstract. Based on the relevant papers of Chinese periodicals in CNKI database from 2000 to 2020 and the information visualization software Citespace, this paper makes a visual analysis on the research of Qiang settlement landscape in China. Through the analysis of the knowledge maps’ structure of the authors, publishers and keywords co-occurrence of the Qiang settlement landscape research, the results show increasing annual publications of such research and a lack of breadth and depth in the content. The results also suggest insufficient connection or integration between fields and disciplines. The research results will be presented in five aspects: local landscape, Qiang culture, architectural cultural area, post-disaster reconstruction and public space. According to the review of the research field, this paper puts forward the following prospects. First, expanding the research scale and the combination of qualitative and quantitative research methods. Second, shifting the research focus to the human-land relationship and diversifying the research field of micro-analysis of spatial morphology by including intelligent management and development and utilization of settlements. Such efforts can provide further theoretical support for the protection, development and practice carried out in the Qiang settlement landscape of China, contributing to achieving the goal of rural revitalization and the implementation of the Beautiful China strategy.

1. Introduction
The Qiang nationality, which originated from the ancient Qiang, is an ancient nation in western China. It is mainly distributed in Mao County, Wenchuan County and Li County of Aba Tibetan and Qiang Autonomous Prefecture in Sichuan Province and Beichuan Qiang Autonomous County of Mianyang City, while the rest are scattered in Danba County of Ganzi Tibetan Autonomous Prefecture of Sichuan Province and Pingwu County of Mianyang City. Qiang settlement includes Qiang rural settlement and Qiang town settlement. It is generally believed that the rural settlement of the Qiang nationality is the traditional settlement of the Qiang nationality, which is the product of the Qiang people under the impact of the western Sichuan plateau and the unique high-altitude natural ecological environment under the specific historical background. While the urban settlement of the Qiang nationality is a new thing that comes into being with the changes of the times, which reflects the change of the Qiang people's way of life and the need of post-disaster reconstruction. The Qiang settlement not only contains the splendid national cultural heritage, but also writes the story of the natural geography and cultural history of
Chinese civilization. Studying the Qiang settlement and excavating the unique landscape on the land of China is conducive to the development of the current construction of the Beautiful China.

2. Data sources and research methods

2.1. The data source
In order to ensure the comprehensiveness and credibility of the data, the CNKI Chinese academic journal (online version) with the largest number of documents and the most complete coverage is taken as the sample data source [1]. Several key words related to Qiang towns and rural settlements are selected for advanced search with the theme "Qiang settlement + Qiang village + Qiang town". The time range is from 2000 to 2020. A total of 1484 articles were obtained. Based on the perspective of landscape architecture, this paper explores the research experience of domestic Qiang settlement landscape, and manually selects the literatures related to landscape architecture, landscape and environment in the search results. Literature and poetry, conference notices, conference solicitation articles, newspaper reports and other irrelevant items are excluded, a total of 345 effective sample documents were obtained, each including author, institution, keywords, abstract, publication date and other information. The search time was September 10, 2020, and all the literatures were exported to Citespace software in refworks format for processing.

2.2. The research method
The research tool used in this paper is the visualization software CiteSpace (version 5.7. R1.64-bit), which can show and analyze the evolution trend and knowledge association state of the frontier of the discipline through visualization functions such as author cooperation, organization distribution, keyword co-occurrence and so on. The CiteSpace software converts the data of the exported literature as the basic data source. Through the analysis of the literatures’ Keyword, Author, Institution and other contents and making the corresponding knowledge graph to understand the overall research status of the Qiang settlement landscape in China, and provide reference for follow-up research.

3. Statistics and Analysis

3.1. Analysis of time Distribution of posts
The annual volume of articles related to the Qiang settlement landscape in China shows an upward trend, which can be divided into two stages (figure 1). The first stage is a slow start from 2000 to 2007. The research at this stage mainly focuses on the defensive function, spatial form and aesthetic feeling of architecture. The second stage is the fluctuating development stage from 2008 to now. The 512 Wenchuan earthquake in 2008 made "post-disaster reconstruction" become the direction of concern in the research field, the number of articles increased suddenly, the popularity lasted for nearly three years, and gradually showed a downward trend in 2011. By the tenth anniversary of the earthquake in 2018, the volume of articles has reached a peak in nearly 20 years, which shows that the study of Qiang settlement landscape is greatly influenced by social hot spots.
Figure 1. Statistical Chart of Annual Distribution of Research papers on settlement Landscape of Qiang nationality from 2000 to 2020.

3.2. The analysis of the author of the paper and cooperative network

The data of 345 valid documents are transformed and imported into Citespace software, and the knowledge graph of author group and cooperative network is generated after relevant settings (figure 2). The number and size of nodes in the figure represent the co-occurrence frequency of the core author group, and the number and thickness of lines reflect the author's cooperation relationship and cooperation intensity. From the point of view of the volume of articles, the first author is La Mingying, with 8 times, followed by Cheng Bin and Wen Xiaofei, 6 times and 5 times respectively. Centrality is an index to measure the importance of nodes in co-occurrence networks, and high centrality nodes are usually the key hubs to connect different hot spots. In the co-occurrence graph of the authors, the authors with high centrality play a bridging role in the cooperative relationship[2]. Two research groups with the highest centrality with Cheng Bin and Wen Xiaofei as the core have been formed. In the degree of cooperation, it shows the characteristics of small concentration and big dispersion.

Figure 2. Cooperative Network of High-yield authors in the study of Qiang settlement Landscape from 2000 to 2020.
3.3. Analysis of Publishing institutions and Cooperative Network

Based on the analysis of the research status and actual contribution of the publishing institutions in the field of Qiang settlement landscape, it is found that colleges and universities are still the main force of the research. Located in the southwest, Sichuan University, Southwest Minzu University, Southwest Jiaotong University, Southwest University of Science and Technology are in the forefront, reflecting the strong regional characteristics of research institutions. Among these universities, architecture-related disciplines have the highest contribution, followed by tourism, history and culture, and art (figure 3). The cooperative relations are mainly internal cooperation, inter-university cooperation and cooperation between universities and social institutions. However, as a whole, it shows the characteristics of low intensity of cooperation and isolation of research, only the institutional cluster represented by Southwest Jiaotong University and Southwest Minzu University is relatively significant.

![Cooperative Network of High-yield institutions for the study of Qiang settlement Landscape from 2000 to 2020.](image)

3.4. Cluster Analysis of keyword Co-occurrence Map

Keywords can reveal the main research direction and core point of view. The detection of the co-occurrence frequency of the keywords in the relevant literature in the research field of Qiang settlement landscape can directly show the research hotspots, research trends and knowledge structure in this field[1]. By using the keyword path calculation method in the software, the highly cited keywords in each time slice are selected to generate the keyword co-occurrence map of Qiang settlement landscape, and further cluster to get the "Timeline" map. The map can not only highlight high-frequency keywords, but also reflect the diachrony of keyword clustering. Set the K value of "Show the largest K Clusters" option to 5 in Citespace to get five clusters: local landscape, Qiang culture, architectural culture area, post-disaster reconstruction and public space (figure 4).
3.4.1. The concept of vernacular landscape research is becoming more clearer. From the perspective of time process, domestic scholars' research on the local landscape of the Qiang nationality has experienced a process from exploration to concept formation. In the key word "evolution", the evolution program of "origin residence-group-complete village" has attracted more attention. Keywords such as "resource utilization mode" and "design" reflect that scholars have begun to pay attention to the relationship between Qiang culture and the utilization of local resources. The overall landscape planning and design of architecture and village plays a bearing role in the expression of local culture as a manifestation of resource utilization. In the reconstruction of Qiang villages after the earthquake, the evolution procedure was once again put forward as an important reference. In order to further explore the construction model of the new landscape of the Qiang village, the concept of "local landscape" was put forward for the first time. From the point of view of architecture, human scale and street aesthetics, different scholars have discussed the inheritance and innovation of Qiang local characteristics in the planning and design of new towns.

3.4.2. Protection and inheritance is the focus of research. In recent years, with the proposal of the strategy of beautiful rural construction and rural revitalization, the protection and renewal, development and utilization of local landscape has become a hot topic in academic circles. From the "Timeline" map, we can see that "protection", "inheritance" and "traditional village" are the three most prominent nodes in the clustering of Qiang culture. The keywords "protection" and "inheritance" first appeared in 2005 and 2010, respectively. Through the analysis, the reason for its occurrence sooner or later is closely related to the 2008 Wenchuan earthquake. Before the earthquake, scholars mainly discussed the protection of traditional and native Qiang culture from the perspective of residential architecture and landscape experience. After the earthquake, some traditional cultural "maternal parents" were destroyed, and the inheritance of "offspring" in the post-disaster reconstruction work needs to be solved urgently. Since 2016, with the development of the protection of "traditional villages" in China, the significance of "tradition" has once again attracted the attention of academia, and many scholars have discussed the protection and inheritance of Qiang culture from the direction of traditional villages.
3.4.3. The research on qiang architecture is more comprehensive. The clustering of architectural culture area is the earliest and the longest among the five clustering of the Qiang people's settlement landscape. In this cluster, the keyword with the earliest occurrence time and the largest node is "Qiang Village". Early studies mainly focused on the shape and structure of residential buildings and the defense function of watchtowers. With the emergence of the key words of "settlement", the research perspective extends from micro-scale to meso-scale, from the structure, material and layout of early building units to the study of building clusters, and discusses the ecological significance and cultural connotation behind it. The relationship between "landscape", "environment" and architecture is more emphasized. Generally speaking, the research is becoming more and more comprehensive and systematic.

3.4.4. Cultural protection and tourism development are two points of high concern in post-disaster reconstruction. Since the Wenchuan earthquake in 2008, "post-disaster reconstruction" has become a hot topic in the study of Qiang settlement landscape. In the process of reconstruction, the development of tourism as an important means of economic recovery, from the formulation of tourism strategy to the implementation of measures to combine tourism development with cultural protection, and then to the evaluation of the role of tourism development, it significantly presents a complete process of research and development. At the same time, the concept of construction planning with the coexistence of protection and development is put forward. From the perspective of tourism, the "foreground, curtain and background" mode of ethnic culture protection and tourism development is put forward [3-4]. Based on the analytic hierarchy process (AHP), the ecosystem security evaluation system of rural tourism destinations was constructed [5], and the development path of ethnic culture ecology in Qiang ethnic region was proposed. From the perspective of architecture and planning, the "foreground - background" combination and separation mode is proposed [6]. Landscape architecture plays an important role in solving the contradiction between cultural protection and tourism development. However, most of the research background is mainly humanities and social sciences, while the research background of natural science is still insufficient.

3.4.5. There are few achievements in the research of settlement public space, and the quantitative research is insufficient. The start time of public space clustering and post-disaster reconstruction clustering are basically the same, so it can be seen that public space design as a specific work of post-disaster reconstruction was carried out in the same period. Generally speaking, there are few literatures on the research of settlement public space. The current research is mainly focused on the static plane form and the subjective evaluation of human history. The quantitative analysis based on digital technology is mostly aimed at local typical cases, but the research on the integrity of landscape in the region is less involved, and has obvious segmentation. Public space mainly includes two categories: towns and villages. There have been related studies on urban public space reconstruction design techniques, design principles, village public space feature analysis, optimal design, change, evaluation system and so on. Most of the studies on the public space of villages take a single typical Qiang village (Luobo village, Buwa village, Taoping Qiang village, etc.) as an example, but some remote traditional villages have not been taken seriously. In the early stage, qualitative research such as field research, literature research, summary and induction are the main means. With the development of digital landscape research in landscape architecture, Liu Kai and others use mathematical formulas such as shape index and fractal dimension to quantitatively study the spatial characteristics of Buwa village [7]. Chen Liqun and others use analytic network process (ANP) to build an evaluation model system to reveal the dominant factors of the public space characteristics of Qiang villages [8]. Compared with the village public space, the changes of urban public space and the evaluation of the use of reconstruction projects need to be discussed.

3.5. Emergence detection of key words
Through the protruding words, we can further explore the cutting-edge trends of the research on the settlement landscape of the Qiang nationality. The so-called protruding words refer to the key terms in
which the frequency suddenly increases or the frequency of use increases significantly in a short period of time. Watchtower is a typical feature of Qiang architecture, so the keyword emergence time is the earliest and the duration is the longest (figure 5). In the early stage, most of the research results are static descriptions such as morphological structure, origin function, cultural connotation, and began to explore the shape evolution of towers in the middle stage. After the emergence period in 2008, the research scope of watchtower was further expanded. Some scholars compare the watchtower of Qiang villages with other defensive residential buildings in China, and put forward that the watchtower is one of the symbiotic cultural substrates in Diqiang ethnic architecture[9]. Explore and practice the reconstruction methods of traditional villages and towns after the earthquake, so that "sustainable development" has become a high-frequency vocabulary in this period. Through the qualitative study on the distribution, type, operation and development of villages and spatial morphological characteristics, the ways to realize sustainable development and cultural protection and inheritance is put forward. Since the strategy of rural revitalization was first put forward in the report of the 19th CPC National Congress in 2017, the cultural protection of traditional villages as an important support for strategic realization and sustainable development, so the emergence rate of "traditional villages" in this period is as high as 8.2538. Especially in the past two years, based on the spatial syntax theory, GIS technology and AHP analysis method, quantitative studies have been carried out on the evolution of village spatial morphology, the planning site selection layout before and after the earthquake and the evaluation of human settlements. It deepens the scientific cognition of the development and change of traditional villages, transformation layout and environmental assessment, and has important guiding significance for the future planning and construction work.

### Top 5 Keywords with the Strongest Citation Bursts

| Keywords                  | Year | Strength | Begin | End  | 2000 - 2020 |
|---------------------------|------|----------|-------|------|-------------|
| Watchtower                | 2000 | 4.2076   | 2000  | 2008 |             |
| Disaster Recovery         | 2000 | 4.0057   | 2008  | 2011 |             |
| Qiang culture             | 2000 | 4.8176   | 2012  | 2014 |             |
| Sustainable Development   | 2000 | 3.1597   | 2012  | 2014 |             |
| Traditional Villages      | 2000 | 8.2538   | 2017  | 2020 |             |

Figure 5. Emergent Words in the Study of Qiang Settlement Landscape from 2000 to 2020.

4. Conclusion

4.1. The research scale is relatively single, and the research objects are mostly concentrated in a few typical Qiang Villages

Qiang village is mainly located in western Sichuan with mountains and valleys, dangerous rapids and closed environment. Topography, climate, site layout, architecture and social culture constitute the link and bridge of the common characteristics of the settlement landscape. However, limited by the traditional survey methods, most of the research objects are the typical individuals who are well protected or developed, such as Taoping Village, Luobo Village, Buwa Village and so on. The settlement analysis pays more attention to the plane expression of two-dimensional space, and it is difficult to obtain and manage the spatial data systematically and comprehensively for a large amount of landscape information in the region. Therefore, the relevant research on the Qiang settlement area remains to be improved.
4.2. The study has obvious segmentation
Architecture scholars focus on the study of the traditional residential buildings, historians and ethnologists focus on the inheritance and protection of history and national culture, and art scholars focus on the study of art. Economists pay more attention to the development and utilization of regional tourism value. The studies of various scholars are lack of mutual integration, reference and intersection.

4.3. The combination cases of qualitative description and quantitative analysis is insufficient
The types of villages are different, the spatial system is complex, and it is difficult to obtain data. The traditional research methods are mainly qualitative research, such as field research, literature research, classification and induction, etc. Although the quantitative analysis of local typical cases is carried out by means of spatial syntax and analytic hierarchy process, the research on the integrity of landscape in the region is seldom involved and has obvious segmentation. On the whole, the number of achievements is small, and the research is in its infancy.

4.4. Lack of systematic and scientific theoretical guidance, the construction process of Qiang traditional villages is relatively backward
In 2014, the Ministry of Housing, Urban and Rural Construction, the Ministry of Culture and the State Administration of Cultural relics put forward the "opinions on doing a good job in the implementation of the Protection Project of Chinese traditional villages". In 2018, the State Administration of Cultural relics carried out the evaluation of the first batch of projects for the overall protection and utilization of traditional villages. In 2020, the Ministry of Housing and Urban-Rural Development uniformly implemented the protection of Chinese traditional village protection signs. As one of the oldest ethnic groups in China, the value of the "traditional village" of the Qiang nationality can not be ignored. However, at present, the number of Qiang state-level traditional villages is relatively small, and there are gaps in the third and fifth batches of selection. The main reasons are as follows. First, western Sichuan is an area with frequent natural disasters, the Qiang nationality area was greatly affected by the 512 earthquake, and many traditional buildings were destroyed, and the remote reconstruction model led to changes in site selection and pattern. Second, although it is rich in intangible cultural heritage resources, due to the influence of the history of ethnic migration, the Qiang nationality is sandwiched between Han and Tibet, the regional characteristics of the village are not distinct, and the landscape "assimilation" is more prominent. Third, the characteristics of "marginalization" in backward areas are obvious, the concentrated distribution or total proportion of traditional buildings is not enough, coupled with the lack of local residents' sense of identity with the value of the village, resulting in poor effectiveness of protection. Fourth, after the disaster, traditional villages are inevitably faced with a series of problems such as the implementation of protection strategies and functional transformation, and the lack of scientific and effective protection planning inevitably makes some design practice results questioned, which affects the development process of village protection to a certain extent.

4.5. The results of post-disaster reconstruction are mixed
No matter from the annual volume of articles or keyword cluster analysis and emergence detection, "post-disaster reconstruction" as a social event with a great impact on the Qiang area has attracted a high degree of attention in academic circles. Domestic scholars have made heated discussions on the methods and models of post-disaster reconstruction, which are generally inseparable from the protection of Qiang culture and the evaluation of reconstruction effects. The social structure, family organization, religious belief, production and life style of the Qiang nationality have constructed a unique settlement space. If we do not follow the scientific and systematic concept of planning and construction, it is bound to cause certain conflicts to the original life trajectory, the original cultural management system and the original customs and concepts of the Qiang people. After more than ten years of practice, we have found that villages such as Taoping Village and Luobo Village retain the traditional historical features to the greatest extent and have good tourism development. There are also reconstruction sites with cultural changes such as the Qiang Valley in Longxi Township [10-11]. The core problem in the landscape...
design of ethnic minority areas is how to effectively dig out the historical and cultural information and show it to people. If we do not actively deal with this problem, it will inevitably lead to the destruction of the traditional ethnic village landscape, the loss of history and the disappearance of cultural heritage.

5. **Prospect**

5.1. **Expand the scale of research to achieve a complete understanding**

Taking the Qiang settlement in an area as the research object, through the horizontal comparison of each settlement to summarize the similarities and differences of the national settlement landscape in different geographical locations, and discuss the law of landscape evolution. At the same time, we should strengthen the research on the "marginalized" original ecological settlement in order to achieve a complete understanding of the Qiang settlement landscape. However, it is not easy to realize the research on the macro scale. A series of traditional processes such as surveying and mapping, research and data collation cost researchers a lot of time and energy, and the amount of data is huge. Therefore, how to make effective use of digital technologies, including image and video retrieval technology, virtual reality technology and 3D reconstruction technology, to improve the accuracy and effectiveness of the research is the key problem that we need to solve.

5.2. **Realize the deep integration of quantitative research and qualitative research**

At present, the research methods of Qiang settlement landscape are mainly literature review, on-the-spot investigation, induction and summary, while the quantitative research based on space syntax, fractal theory, analytic hierarchy process and mathematical model is still in its infancy. The research results of the integration and innovation of a variety of methods are relatively few, which is also the bottleneck problem that the research methods need to break through in the future. At the same time, the Qiang settlement area has obvious characteristics and rich cultural connotations, so it is difficult to show the characteristics of regionality and diversity by relying solely on digital technology. Therefore, we must seek the diversified integration path of digitization and combine the modern digital technology with the traditional qualitative research methods.

5.3. **Paying attention to the Ecological problems of Qiang settlement and optimizing the relationship between Man and Land in the Upper reaches of Minjiang River**

In the upper reaches of the Minjiang River where the Qiang settlement is located, due to the complex geological structure and the prominent contradiction between human and land, its ecosystem is extremely fragile and sensitive, and natural disasters such as collapses and landslides and soil erosion occur frequently [12]. However, from the research on the settlement landscape of the Qiang nationality in the past two decades, there are few research achievements related to ecological issues. In the era of ecological civilization, relevant scholars should pay more attention to natural and ecological problems, regard the Qiang settlement as an ecosystem, and introduce the concepts of niche, ecological ecotone, entropy and so on. Try to use landscape means to solve ecological problems, actively find ways to optimize the relationship between man and land and guide the practice of planning and design.

5.4. **Carry out file-based protection of Qiang villages and explore intelligent development and application**

File-based protection is to transform intangible cultural factors in cultural heritage into tangible information records by means of words, pictures, audio and video, so as to keep and inherit them, and fully popularize them in practice. To set up a timely, true and complete archive for the collapse or damage of Qiang towers and residential buildings due to natural disasters or old age, which will serve as an important basis for reconstruction or repair in the future. Because the Qiang people have no words, the inheritance of intangible cultures such as folk festivals and traditional handicrafts depends on oral instruction. In order to prevent these precious legacies from disappearing forever, they should be transcribed and solidified in time by means of dictation, audio recording, video recording and other
archival methods. To achieve the digitization, data and information management of village archives, combined with intelligent technology and platform, actively explore ways of intelligent development and application, such as Qiang culture VR, AR exhibition, three-dimensional projection of village relics, virtual reproduction of the original appearance of the village, etc.[13-14].

5.5. Build a network guidance system to reduce the subjective deviation of planning and design
The problem of landscape variation in post-disaster reconstruction is mainly due to the lack of interdisciplinary knowledge literacy such as ethnology, cultural anthropology and so on, resulting in a deviation in the understanding of the cultural heritage of the Qiang nationality [10]. Subjective planning and design can not meet the landscape experience needs of the crowd. Today, when the network is highly developed, we should use the network platform to build a complete planning and design guidance system to make the planning and design process more rational and the planning and design results more acceptable to the public. In order to solve the problem that it is difficult to obtain detailed information, understanding is prone to deviation, and it is difficult to understand the wishes of different groups, this system can include three subsystems: Qiang settlement Archive, discipline Exchange Center and Landscape Evaluation platform, which provide planners with a platform to fully understand the local culture, interdisciplinary communication and information feedback before, during and after the planning and design.

5.6. Establishing the Community Co-Management Mechanism of Tourism Development to promote the Sustainable Development of Qiang settlement
At present, community co-management mechanism has been widely used in the field of nature reserve management, and there have been some successful experiences. Community co-management is a process to achieve the dual goals of ecological protection and sustainable development, and to realize the sharing of rights, responsibilities and interests. In the process of tourism development, Qiang settlement is also faced with the problem of inheritance and protection, which involves the coordination of the interests of Qiang people, government, tourism developers, tourists and so on. Community co-management mechanism not only provides a new idea for "protection" and "development", but also an effective way to deal with multi-agent relations. It has high applicability in promoting the sustainable development of Qiang settlements and raising the awareness of residents' participation.

5.7. Take the road of compound development and join the ranks of state-level traditional villages
According to the main functions, the traditional villages of the Qiang nationality can be divided into agricultural and animal husbandry type, tourism type and compound type. At present, there are only 4 compound traditional villages [15]. This is a kind of enlightenment to the traditional villages with single function. In the process of development in the future, they should make full use of all kinds of resources, look for development opportunities from national policies, and build a model of protection and development compatible with universality and uniqueness. They should explore the development direction of their own characteristics under the effective practice mode, and get close to the standard of the national traditional village.

Acknowledgments
A Project supported by National Natural Science Foundation of China (Grant NO.52008277), supported by Research Center for the Protection and Development of Local Cultural Resources (DFWH2019-025), Supported by Sichuan Landscape and Recreation Research Center (JGYQ2019026). Supported by social science research project of Sichuan Agricultural University in 2019（1921993560）

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