

The Role of Bridges in the Shaping of Specific Historical and Cultural Landscapes: A Case Study of Jianchuan, Yunnan

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Abstract

This study is based on first-hand research data and uses the three steps of Open Coding, Axial Coding, and Selective Coding in grounded theory to conduct an in-depth analysis of the bridges in the historical and cultural context of Jianchuan County, Yunnan, China. A theoretical model of cultural landscape interaction in a specific area also is constructed with bridges as the theme. This research aims to gain insights into the functions and forms of different types of bridges, analyze the long-term interaction patterns between people and rivers, reveal the living and production needs of local people, and determine how bridges in the area are integrated, shaped, and continue to influence the local cultural landscape. This study shows that bridges reflect the interaction patterns between local people and rivers driven by basic needs. Bridges also participate deeply in the cultural landscape along the river, shaping it through their connections. During this process, convenient transportation has transformed the landscape. Bridges have become an important carrier for connecting different communities and cultures, enriching historical and cultural landscapes along rivers, and effectively enhancing agricultural landscapes as well as cultural and ecological values. This study provides an understanding of the dynamic evolution of cultural landscapes in the area and establishes theoretical support for the protection and management of cultural heritage, as well as urban planning, to ensure that historical bridges are effectively protected and inherited in the process of modernization, referencing data to optimize future bridge design and urban space layouts.

Keywords

Bridges; Interaction between people and rivers; Cultural landscape; Cultural heritage; Urban development

1. Introduction

With the acceleration of global urbanization, bridges, as an important part of the modern transportation infrastructure, play an increasingly important role in improving transportation efficiency and promoting urban expansion. However, meeting the needs of modernization while taking into account the value of surrounding historical heritage and ensuring the integrity of cultural landscapes in bridge construction has become a common challenge in the fields of urban planning and cultural heritage protection.

The research questions for this study are as follows:

- 1) How to explore the interaction between people and rivers by studying the types of bridges within the conceptual framework of the cultural landscape.
- 2) How to summarize people's needs for building bridges from the analysis of bridge types.
- 3) How to explain the functions of different types of bridges through needs and reveal the role of bridges in shaping cultural landscapes (Figure 1).

The research objectives are as follows:

- 1) To collect first-hand data on bridges along the Yongfeng River through fieldwork, including on-site photos and information on the geographical location. At the same time, to collect the latitude and longitude geographical data on immovable cultural relics in Jinhua Town, Jianchuan County, Yunnan, China. Participatory observation is used to collect data on the surrounding natural and human environment, including specific cultural customs, festivals and religious activities, and the organization of the surrounding environment. The purpose is to examine the historical and contemporary context of bridges in the study area from a holistic perspective of the cultural landscape.
- 2) To analyze the data through a coding process based on grounded theory that considers the type of connection between bridges and both sides of the river, the function of bridges, different bridge construction needs along the river, and the social and cultural value of bridges in the study area.
- 3) Based on the research findings, to explore the role of bridges in the region in shaping the landscape along the river and the potential challenges and development possibilities of bridges in future construction, optimization, and cultural heritage protection.
- 4) To construct a theoretical model of cultural landscape interaction in a specific area with bridges as the theme, to optimize future bridge design and the urban space layout, enhance the integrity of cultural landscapes, and ensure the continuation of the historical value and cultural significance of other heritage sites.

As a product of the interaction between society and nature, bridges not only are an important part of the infrastructure in the study area, but some ancient bridges also have become heritage sites, carrying the history and memory of the city. The special geographical and social environment may lead to numerous bridge construction and optimization needs in a study area. A large number of simple bridges in a community that only focus on economy and practicality are likely to destroy the visual integrity of the original cultural landscape and historical relics while also potentially changing the historical and cultural identity of the community. Therefore, between urban bridge construction and cultural heritage protection, funding allocation becomes a key issue.

Based on primary data and grounded theory, this study provides a theoretical model of cultural landscape interaction in a specific area with bridges as the theme (Figure 1). The study shows that analyzing the classification of bridges and their connection with both sides of a river will facilitate the understanding of construction needs, functions, and values of bridges in different river sections. Explaining the frequent exchanges of social and cultural activities between different regions can further illustrate the connection value of core bridges in terms of geography, society, culture, etc. The research results also will help with an understanding of the dynamic interactive pattern of the cultural landscape in the area, thereby promoting the improvement of the concept and management measures of cultural heritage protection. In addition, this study will help to coordinate the core issue of funding allocation for urban bridge construction. The types of bridges, the demand

and functions of bridges in different river sections, and especially the discovery of core bridges will help weigh the priorities of funding allocation and assist evidence-based allocation of government economic resources. Ultimately, the analysis will better optimize future bridge design and the urban space layout, enhance the integrity of cultural landscapes, and ensure continuation of the historical value and cultural significance of other heritage sites.

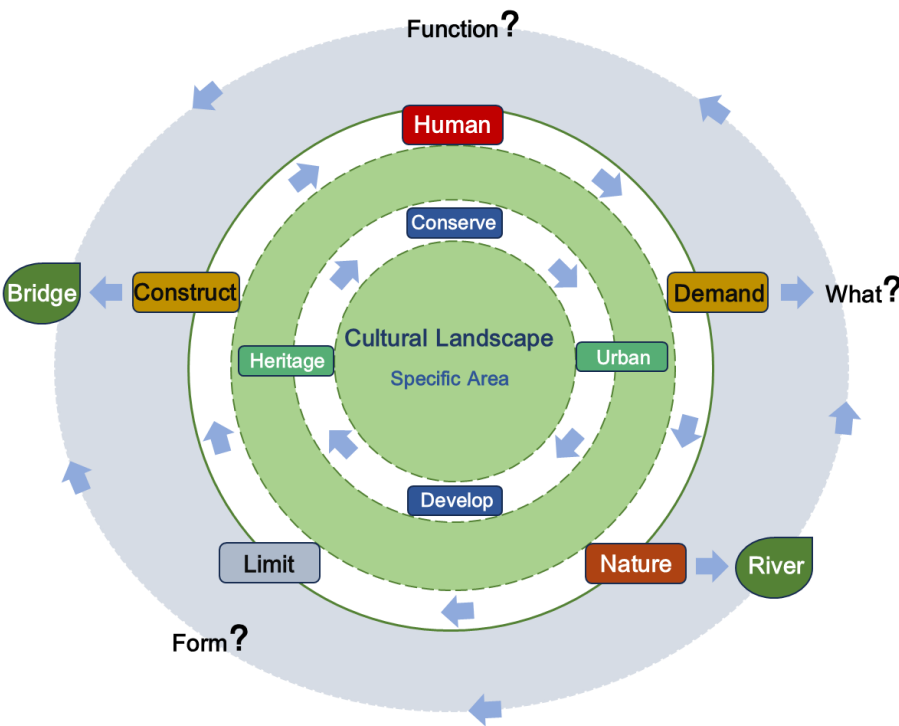


Figure 1. Theoretical framework.
 Source: Author, 2024.

2. Theoretical Framework

Bridges play an important role in the relationship between people and rivers while shaping cultural landscapes. As important elements in the natural environment, rivers not only provide water resources and transportation convenience for humans but also have a profound impact on the organization of social spaces due to their natural barrier function. UNESCO defines cultural landscapes as “outstanding examples of interaction between nature and humans, reflecting the unique relationship between culture and the environment” (The United Nations Educational, Scientific and Cultural Organization [UNESCO], 2008). “Interaction” as a core concept helps to reveal the complex relationship between humans and nature along with social and cultural factors. By studying the interactive process, one can better understand the formation and evolution of cultural landscapes and human needs, cultural symbols, and social structures behind them. As an important part of cultural landscapes, bridges reflect the utilization and transformation of the natural environment by local people during different historical periods. At the same time, the functions and forms of bridges also reflect people’s production and living needs in specific environments.

2.1 Cultural Landscape

The geographer Carl Sauer first proposed the concept of cultural landscape, believing it to be created by human activities on the basis of natural landscape (Sauer, 2008). UNESCO defined cultural landscapes as “products of the co-evolution of culture and nature, demonstrating a unique combination of cultural history and the natural environment in an area” (UNESCO, 2008). Taylor (2008) also pointed out that cultural landscapes not only include physical features in the natural environment but also cultural values, belief systems, and the economic activities of human society (Taylor, 2008).

Over time, the definition and research scope of cultural landscapes have gradually expanded, especially in the context of cultural heritage protection, being regarded as a comprehensive expression of the combination of material culture and the natural environment (Mitchell et al., 2015). This landscape reflects the cultural practices of humans in a specific geographical area and includes the role played by the natural environment (Jones, 2003). It also includes the way in which humans manage natural resources while maintaining specific ecosystems (Fowler, 2003). Scholars generally believe that cultural landscapes are the intersection of nature and culture and can reveal the complex relationship between cultural and environmental change (Antrop, 2005).

The protection and management of cultural landscapes face many challenges, especially in the process of globalization and urbanization. The pace of change in traditional landscapes has accelerated, increasing the urgency to protect these cultural heritages (Plieninger & Bieling, 2012). Therefore, the concept of cultural landscapes has been widely used to analyze and protect geographical areas with important historical, social, and cultural values (Taylor & Lennon, 2011). The World Heritage Committee pays special attention to cultural landscapes because they not only show the history of interaction between nature and humans but also provide valuable experience for sustainable development (Fowler, 2003).

2.2 Concept of Interaction

In the study of cultural landscapes, the concept of interaction refers to the dynamic relationship between humans and the natural environment, manifested through the transformation and management of landscapes through human activities (Sauer, 2008). This interaction is not merely the simple use of natural resources but also includes the impact of cultural, economic, and social factors on the natural environment (Antrop, 2005). The formation and evolution of cultural landscapes reflect the life, production, and belief systems of different social groups during a specific historical period through interactions with the natural environment (Jones, 2003).

The interaction pattern of cultural landscapes can be reflected in land use, agricultural practices, and infrastructure construction. These activities not only change the natural landscape but also shape the social and cultural characteristics of a specific area (Plieninger & Bieling, 2012). In addition, the interaction process between humans and nature usually is long-term and complex, involving different historical stages and the intersection of multiple cultural factors. Especially in the context of globalization, the integration of modern technology and traditional practices has made this interaction more diverse (Taylor, 2008).

Research on the concept of interaction also emphasizes the dynamic characteristics of cultural landscapes. That is, landscapes change over time and are renewed through continuous interaction with society and the environment (Mitchell et al., 2015). Therefore, cultural landscapes not only are the legacy of past human activities but also continue to play a role in contemporary society, providing a continuous impetus for social development through cultural inheritance and environmental adaptation (Jones, 2003).

In the balance between modern urban development and cultural heritage protection, research focuses on the two-way interaction between humans and cultural landscapes (Taylor & Lennon, 2011), emphasizing the coordination between heritage protection and the functional needs of modern cities. Through a deep understanding of cultural landscapes, planners can ensure that cultural heritage is properly protected and managed while meeting the needs of urban expansion (Fowler, 2003). Interaction research focuses particularly on dynamic characteristics; that is, cultural landscapes continue to support future urban development in the process of constantly adapting to the needs of modernization (Davoudi et al., 2012). Interaction research on cultural landscapes also shows that tradition and modernization may not necessarily be mutually exclusive. On the contrary, by integrating heritage protection with modernization needs, cities can shape their unique cultural identity, which not only enhances the competitiveness of the city but also improves the citizens' sense of belonging (Rössler, 2006).

3. Research Methods

3.1 Case Study

A case study involves the examination of a single or several situations in depth and generally is used to explore complex social phenomena or processes. This research analyzes how bridges adapt to social, economic, and cultural changes through an in-depth case study of bridges in the specific historical and cultural context of Jianchuan County, Yunnan Province, China. According to a government document released on the Chinese government website, Jianchuan County officially was listed as a National Historical and Cultural City on March 15, 2023 (The State Council's Reply on Approving the List of Jianchuan County, Yunnan Province as a National Historical and Cultural City, 2023). A National Historical and Cultural City is a title established by China to protect cities with historical and cultural value, referring to a city with a long history and profound cultural heritage. The historical and cultural heritage of these cities not only is of great importance to the region but also represents a certain value to the cultural development of the whole country and even humankind. In addition, this intangible cultural heritage has been successfully inherited and protected and continues to have an impact on the lives of local residents (Regulations on the Protection of Historical and Cultural Cities, Towns and Villages, 2008; Urban and Rural Planning Law of the People's Republic of China, 2007):

Yongfeng River: Originating from Laojun Mountain, it flows southward from Yanchanggou through the northern part of Jianchuan County and into Jianhu Lake. The "Kangxi Jianchuan Prefecture Annals" called it "Yachangshui," while the "Daoguang Yunnan General Annals" called it the "Yachang River." It was renamed the "Yongfeng River" in 1952. The upper reaches flow into the Yongfeng Reservoir. The total length of the Manxianlin Reservoir is 15 km (Local Chronicle Compilation Committee of Jianchuan County, 1978-2005, p. 39).

This study takes the Yongfeng River as the center and divides the riverside into three areas according to the natural and socio-cultural features, namely, the forest area, county town, and rural area (Figure 2). Construction of the Manxianlin Reservoir started in 2003 and was completed in 2007. It is an important water source for production and life in Jianchuan County. The Manxianlin Reservoir is located 4.25 km downstream of the Yongfeng Reservoir and is a regulating downstream reservoir. This study focuses on the river section from the Manxianlin Reservoir to Jianhu Lake, which is 10.25 km long. The upper reaches of this river section meander through the dense forests in the valley, and the river flows from the Manxianlin Reservoir to the county town of Jianchuan County. After passing through the county town, the middle section of the river

passes through Jinlong, Zhongdeng, and Xiadeng Villages and reaches the farmland around Xiangqian Village. The end section of the river crosses the G214 National Highway and then flows through Liuying Village. There are many farmlands at the end of the river that border the Jianhu Wetland and eventually flow into Jianhu Lake.

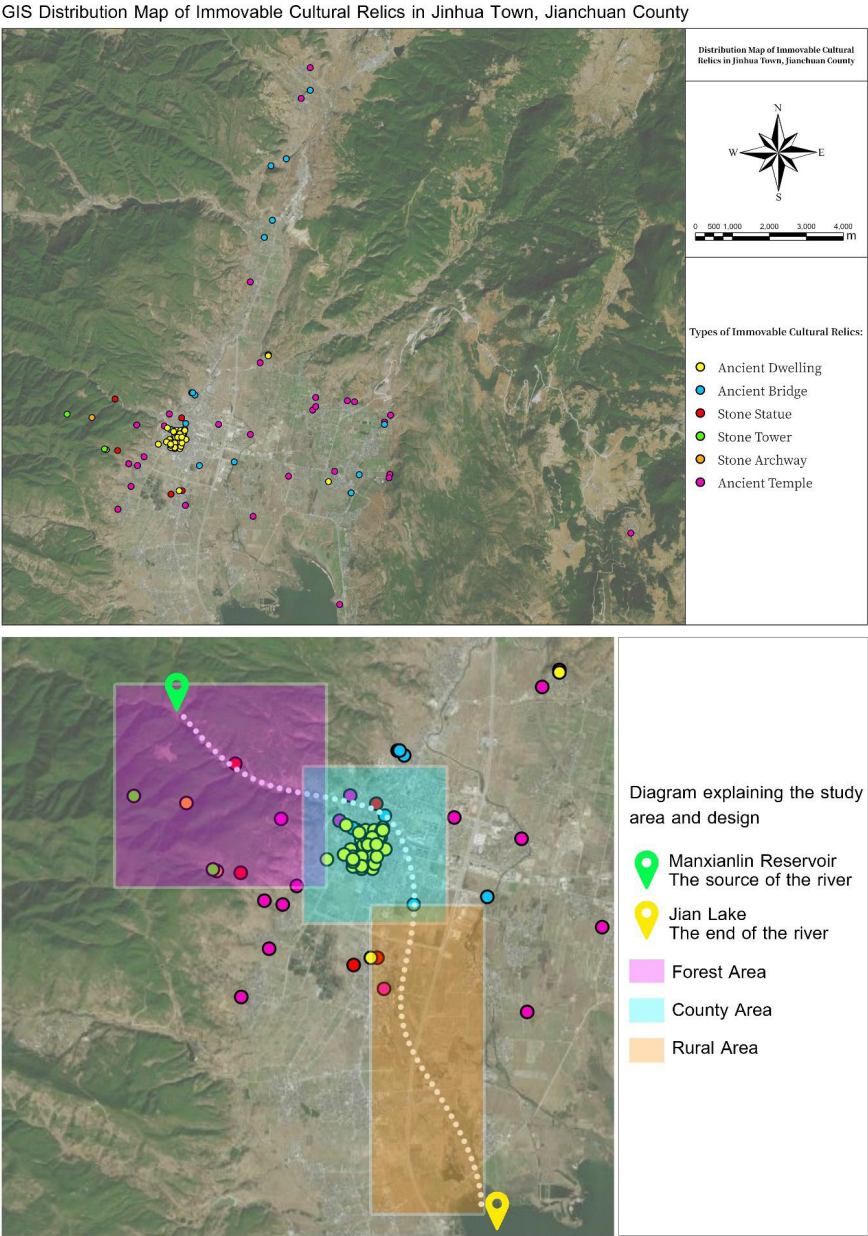


Figure 2. Diagram explaining the study area and design.

Source: GIS (Geographic Information System) data and maps, annotated by the author, 2023–2024.

3.2 Data Collection Methods

The cultural landscape is the result of the interactions between the natural environment and human activities. Human activities such as agriculture, construction, and transportation infrastructure are important drivers of the dynamic evolution of cultural landscapes (Sauer, 2008; UNESCO, 2008). Under the principles of sustainable use and modern adaptation, the dynamic nature of cultural landscapes reflects their continuity with history while adapting to modern development needs. The modern functions of the landscape and its cultural heritage value must be balanced to maintain cultural and natural values when coping with modern challenges

such as urban expansion and infrastructure construction (Fairclough, 2003; UNESCO, 2008). In addition, Matthew Johnson's research shows the importance of historical buildings and sites in cultural landscapes. He analyzes how the material left by human activities has become an important part of the landscape (Johnson, 2008), especially components such as buildings, historical sites, and natural features, reflecting the sense of belonging and cultural identity of local people (Tuan, 1977).

Therefore, this study is based on first-hand data. Focusing on fieldwork, the geographical and cultural data of bridges along the Yongfeng River were collected. Through participatory observation, the lives and social and cultural practices of local residents (sacrifices, markets, festivals,) were experienced and recorded, and combined with semi-structured open interviews, a comprehensive understanding of the relationship between heritage and the community was formed. The interview locations focused on the route to the site of the Jinhua Ancient Temple Fair (forest area), the site of the Bai Torch Festival (county area), and a regular market for the people of the whole county held on the central street of Jianchuan Ancient City every weekend (county area). The 55 interviewees were mainly Jianchuan people from various villages and towns who participated in sacrificial activities (Figure 8b and 8c), markets (Figure 9b), and festivals (Figure 9c)

Finally, to ensure the credibility of the study, the researchers combined multimethod verification (triangulation) in the data collection and analysis process to confirm the authenticity of the data and the reliability of the study: 1) Four local cultural heritage experts were invited to verify the importance of sacrificial activities, festivals, and fairs in maintaining the local social and cultural ecology; 2) Two local urban planning officials were interviewed to further understand the construction history and future potential of different bridges along the Yongfeng River; 3) Three officials from the cultural relics protection and management department checked and supplemented the location data of immovable cultural relics; and 4) Combined with the documentary method, the historical and cultural value of these customary activities was further verified.

3.3 Data Recording Methods

This study primarily used maps and photos as recording methods. Based on the Footprint, Camera and Photos mobile phone application, the route of the field investigation and the positioning of the field photos were recorded by the author, as shown in Figure 3, to improve the authenticity of the research data. In addition, this recording method can effectively combine photos and maps and improve the clarity of descriptions and the understanding of data analysis, theme coding, and theory construction (see the data analysis and discussion section for details). The second method involved the audio recording of the interviews, mainly with the use of handwritten notes.

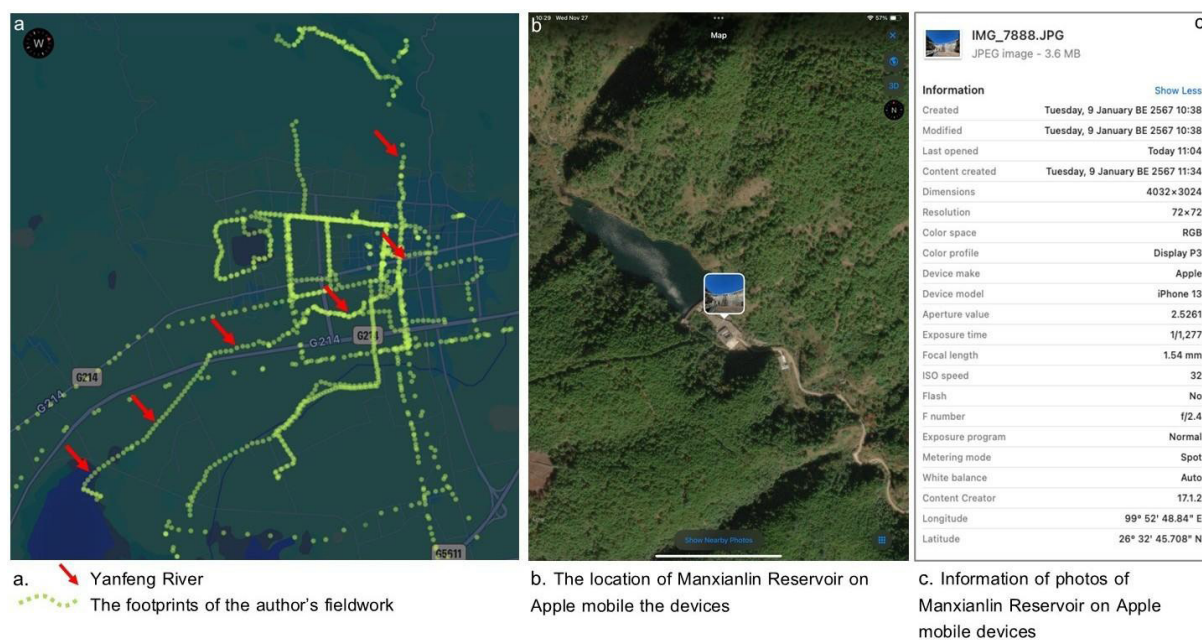


Figure 3. Examples of data recording and presentation methods.

Source: Author, 2023–2024.

3.4 Grounded Theory

Grounded theory is a qualitative research method, the main purpose of which is to build a theory based on empirical data (Glaser & Strauss, 2017). Case study methods usually do not have strict assumptions or structures that depend on grounded theory, a research method that generates theories from field data. It emphasizes the bottom-up approach and gradually builds theories to explain phenomena through systematic data collection and analysis. The uniqueness of grounded theory in qualitative research is that it does not verify hypotheses from existing theories but generates theories closely related to data through close contact with actual situations.

This study is directly rooted in actual data. Based on Strauss's qualitative data coding method (Glaser & Strauss, 2017), the researcher reviewed the data from three scenarios, using different codes each time, and coded the same batch of original data three times, namely open coding, axial coding and selective coding (Neuman & Kreuger, 2003). The detailed analysis process is as follows:

- 1) Open Coding: A preliminary analysis of the data was conducted (Figure 2) and the connection types were decomposed between the bridge and two banks (Figure 4 and 5), as well as the core bridges (Figure 6 and 7). Combined with the GIS distribution map of immovable cultural relics, on-site photos, interview notes, and literature are classified and organized.
- 2) Axial Coding: The type of connection between the bridge and the two banks reflects the interaction pattern between people and the river, which is used to analyze the needs generated in the symbiosis between people and the river (Section 5.1) and the functions of the bridge (Section 5.2.1). This process involves extracting key information and themes from a large amount of field and interview data provided by local villagers (Figures 8, 9, and 10).

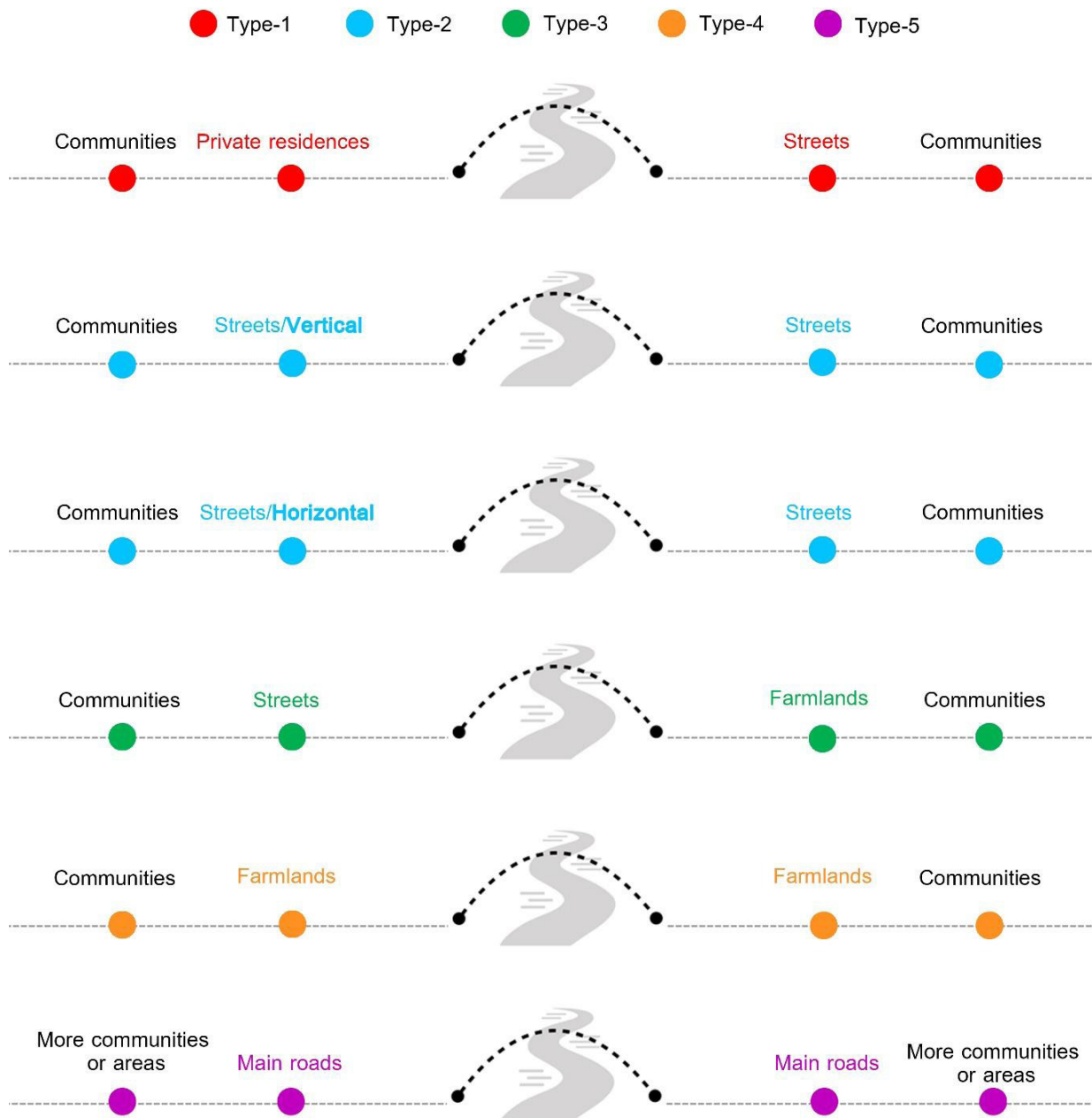
- 3) Selective Coding: This study focuses on the functions of bridges and analyzes their role in the cultural landscape (Section 5.2.2). This process focuses on evaluating and verifying the effectiveness of the first two coding processes. It involves analyzing and summarizing the interview data with planning and engineering professionals.
- 4) Finally, a theoretical model of cultural landscape interaction in a specific area with bridges as the theme is constructed (Figures 1 and 11).

4. Research Data Analysis and Findings

4.1 Research Findings 1: Interaction Patterns between People and Rivers

As an important structure connecting the two sides of the river, a bridge not only represents the manifestation of engineering technology but also reflects the diverse modes of interaction between people and the river. The type of bridge connection in this area reflects the practical interaction between people and nature, thereby meeting the basic needs of production and life. The study findings revealed that the connection between the bridge and two sides of the river in this area can be manifested into five main types:

- 1) With the development of urbanization, the number of houses on both sides of the river has increased, along with the travel distance of residents living on both sides of the river bank. To shorten the travel distance, many residents have opened private doors in the wall on the side close to the riverbank and built bridges. This type of bridge is private and only used by the residents of this household for transportation (Figure 4, Type-1).
- 2) Usually, if there is a river at the end of a community street, residents will build a bridge between the end of that street and the street on the opposite bank. This type of bridge is used for public pedestrian access, but in most cases, it is more popular with residents living near the river. If rivers were flanked by streets, bridges would be used more frequently, and their functionality and value to communities and the urban landscape would be more prominent (Figure 4, Type-2).
- 3) The third type of bridge connects the village community with the cultivated land. In most cases, it is used by pedestrians. The users are residents whose cultivated land is close to a house or village community. They can reach their own fields by walking over the bridge (Figure 4, Type-3).
- 4) The fourth type of bridge is situated in a large area of cultivated land, far away from the community, and where the river is relatively wide. It usually is used as a highway bridge, mainly for agricultural transportation and exchanges between villages (Figure 4, Type-4).
- 5) The fifth type of bridge is located on a main urban road. It usually connects wider communities, villages or areas and has a significant impact on the urban pattern (Figure 4, Type-5).



Sample: 52 bridges along the Yongfeng River

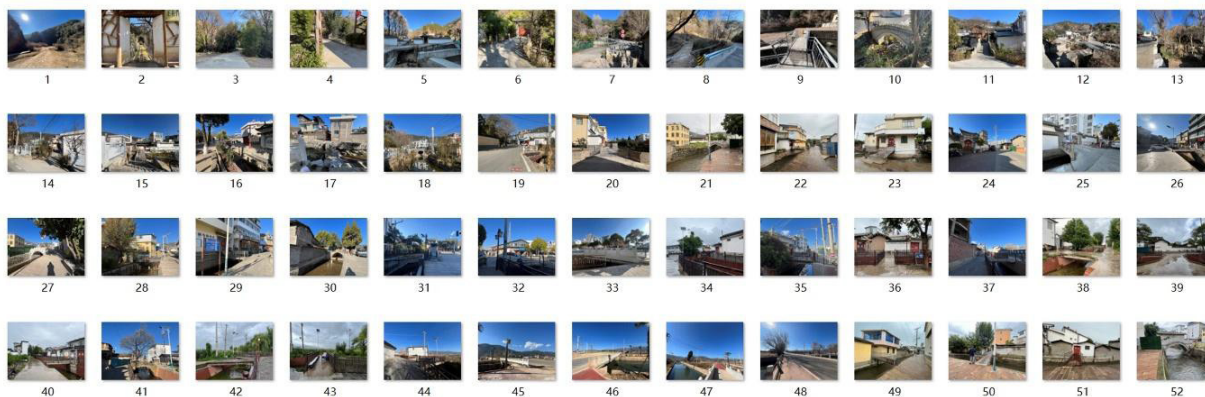


Figure 4. Types of connections between bridges and two banks.

Source: Author, 2023–2024.



● Type-1



● Type-2 Streets/Vertical



● Type-2 Streets/Horizontal



● Type-3



● Type-4



● Type-5



Figure 5. Reference photos of the type of connections between bridges and two banks.

Source: Author, 2023–2024.

4.2 Research Finding 2: Bridges play an Important Role in Shaping and Maintaining the Cultural Landscape

As shown in Figure 6, the three bridges along the Yongfeng River connect Jinhua Town, Jianchuan County, creating an important hub and connecting different landscapes. They show the different interactive relationships between humans and the natural environment in terms of both material heritage (such as ancient buildings, roads, bridges, etc.) and intangible cultural significance (such as social customs, religious beliefs, land use patterns, etc.). The long-term interaction between humans and nature has resulted in the formation of a cultural landscape with rich connotations and uniqueness.

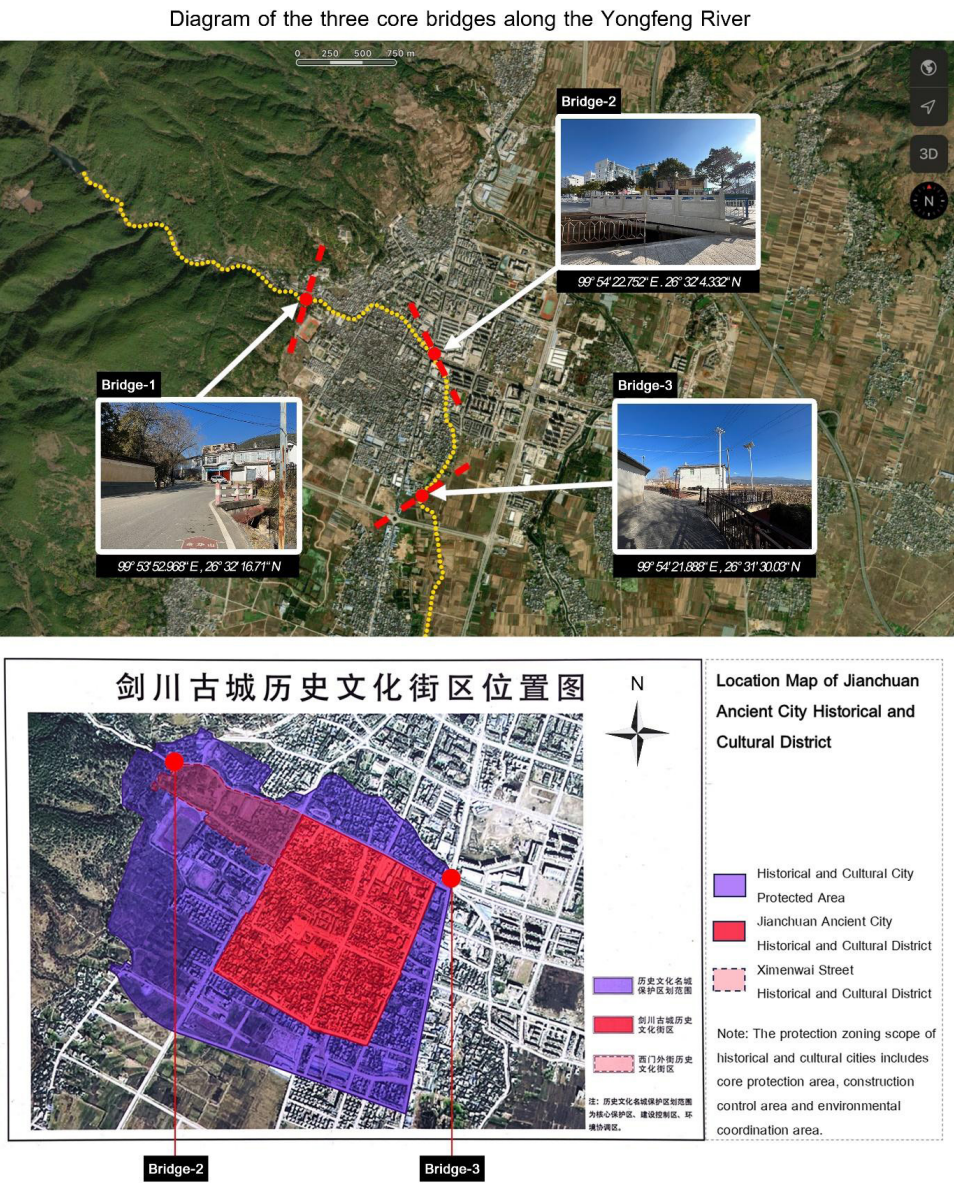


Figure 6. Location map of the three core bridges along the Yongfeng River.

Source: The map in the diagram of the three core bridges along the Yongfeng River has been taken from Apple Maps. The Location Map of Jianchuan Ancient City Historical and Cultural District was released by the Yunnan Provincial People's Government in January 2021 and photographed by the author in 2023 from the bulletin board in Jianchuan Ancient City. Photos of the bridges were taken and marked by the author.

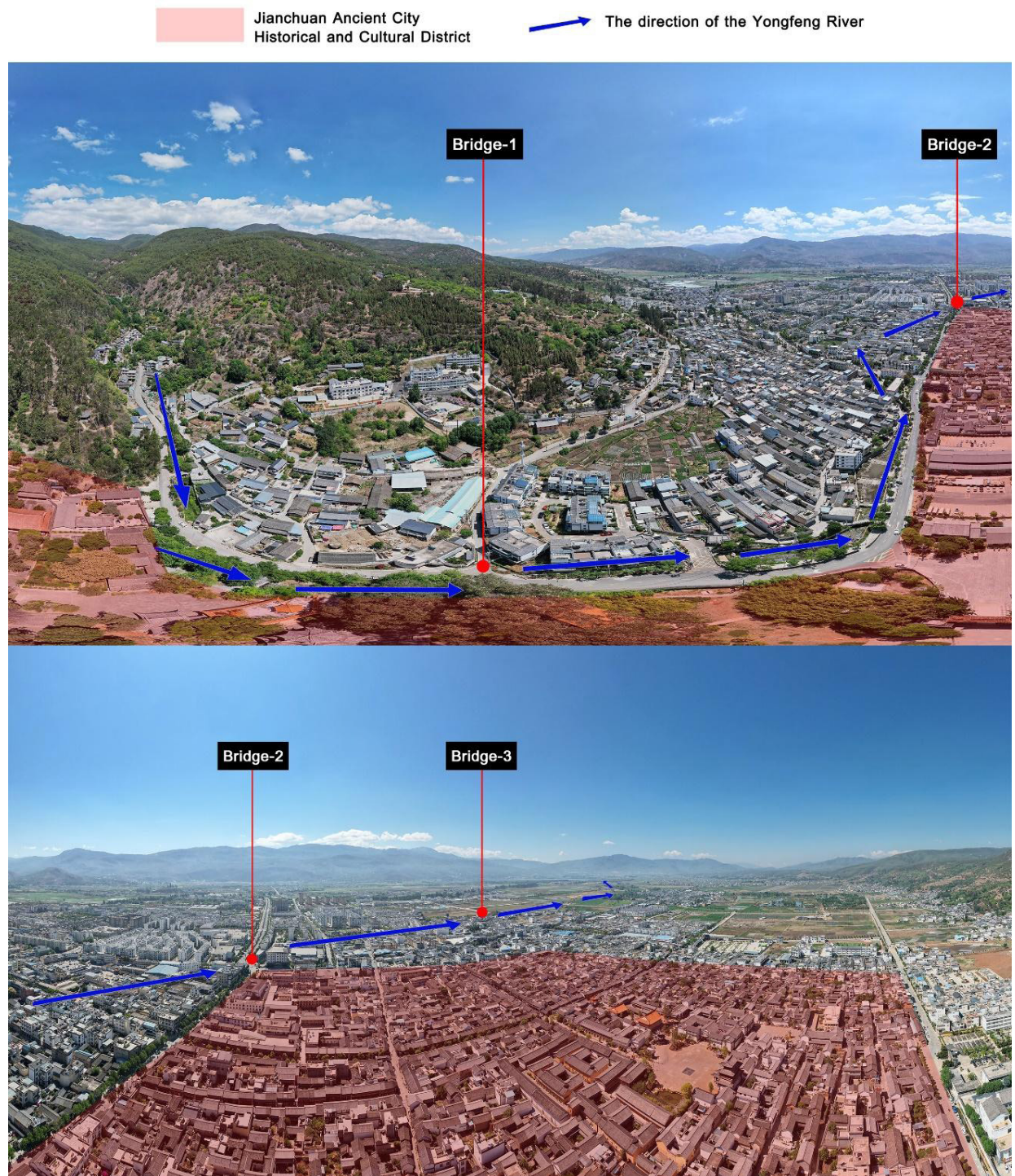
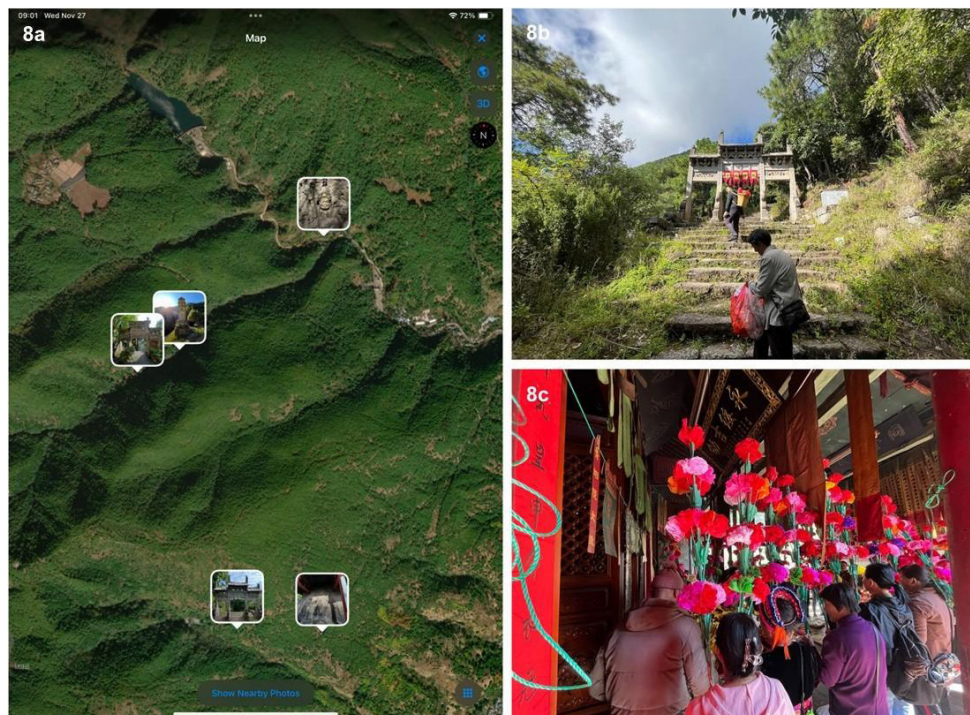


Figure 7. Surrounding environment of the three core bridges.

Source: Author, 2024.

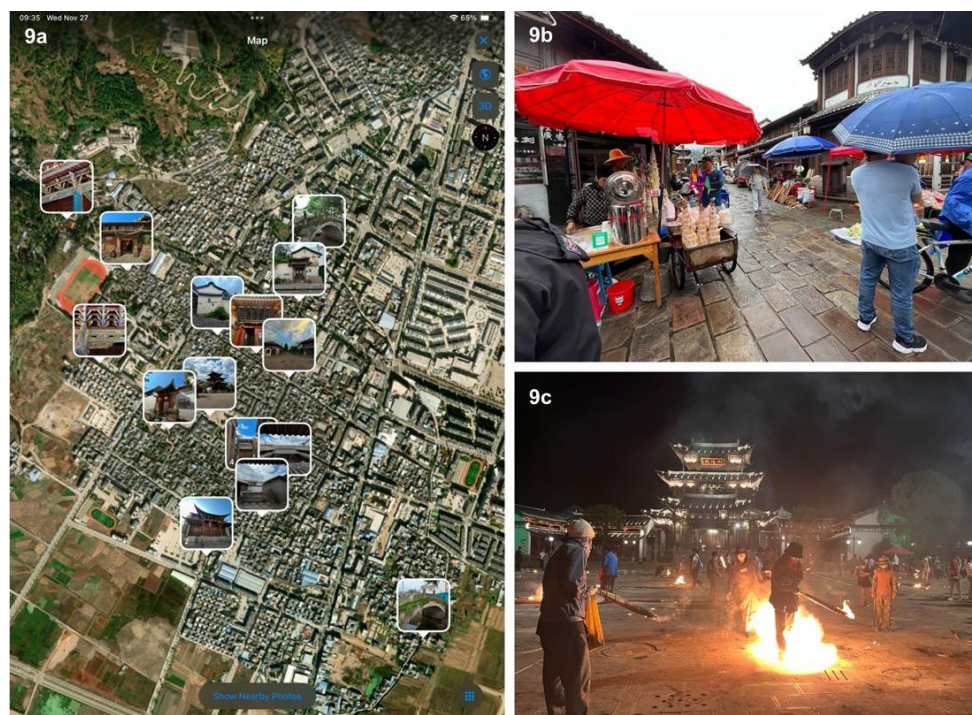
- 1) Figure 6 shows the “Jianchuan Ancient City Historical and Cultural Block Location Map” released by the Yunnan Provincial People’s Government in January 2021. In the historical and cultural city protection area, Bridges 1 and 2 along the Yongfeng River both are key locations within the zoning scope. Bridge 1 also is the intersection of the forest area and county town, and the intersection of Manxianlin Highway and Jinshi Road. This section of the road is the only place vehicles can enter the forest area (Manxianlin Highway). Therefore, Bridge 1 can be regarded as a critical point in the transition from a natural to an urban landscape. However, this area is not a pure natural landscape. The main types of cultural relics currently preserved in the forest area consist of stone statues, stone towers, and stone archways, which are inseparable from the unique natural landscapes. These cultural relics maintain close interactions with local residents through local customs, thus demonstrating the characteristics of an associative cultural landscape (Figures 2 and 8). Associative cultural landscapes often are closely related to certain religious beliefs or spiritual symbols. For example, landscapes around sacred mountains, rivers, or religious buildings may be considered to have special value because of their association with sacred things (Fowler, 2003).
- 2) At the same time, the Yongfeng River divides the county into two parts, and together with Bridge 2, it becomes a key element in the division of the core protection and non-protection area (Figure 6). The core protection area contains a large number of immovable cultural relics (List of Immovable Cultural Relics in the Third National Cultural Relics Census of Jianchuan County, 2021) (Figure 2) and has high historical, artistic, and scientific value (List of Cultural Relics Protection Units in Jianchuan County, 2013). Modern urban development is centered in the non-core protection area. The Yongfeng River and each bridge play an important role in the spatial pattern of the modern urban development. The river serves as a natural dividing line from the geographical perspective, while the bridges serve as the core link to ensure cross-strait economic and cultural exchanges (Figure 9). The area ultimately presents an urban landscape in which history and modernity co-exist.
- 3) As can be observed from Figure 6, Bridge 3 connects the community and farmland. While providing convenience for villagers in the area to farm, it also serves as a key element in the division of the county town and rural areas. The largest farming area in Jinhua Town can be accessed by crossing the bridge. The human environment also has undergone tremendous changes, as the urban landscape is intertwined with history and modernity to create a traditional agricultural cultural landscape. In addition, long-term agricultural production activities have not destroyed the natural ecological environment of the area, with the natural and agricultural landscapes along the river becoming harmonious and integrated. Therefore, the local government has built an ecological trail along the river to enhance the health of residents, improve the surrounding agricultural transportation, and promote tourism (Figure 10).



8a. Immovable cultural relics scattered around the forest area, from photos and locations displayed on Apple mobile devices.
8b and 8c. Local people worshipping cultural relics during a specific period (from September 1 to 9 in the Chinese lunar calendar, the Jinhua Ancient Temple Fair).

Figure 8. Forest areas, natural and cultural landscapes.

Source: Author, 2023–2024.



9a. Some of the immovable cultural relics scattered around the county area come from photos and locations displayed on Apple mobile devices.
9b. A regular market for people from the entire county, held every weekend in the central street of the town.
9c. The Torch Festival of the Bai Nationality. A regular festival for the entire county. It is held once a year (June 25 of the Chinese lunar calendar) with every household in the county participating. The celebration is held in the county town, with many local people and tourists visiting on that day.

Figure 9. The county area, historical and cultural landscapes.

Source: Author, 2023–2024.



10a. Real scenes in rural areas along the Yongfeng River. Photos and locations displayed on an Apple mobile device.
10b. A magnified image of the rural environment in the middle section of the Yongfeng River.
10c. Lower reaches of the Yongfeng River, the end of the agricultural area. The ecological trail was built by the local government to enhance the health of residents, improve the surrounding agricultural transportation, and promote tourism.

Figure 10. Rural areas, agricultural, cultural, and ecological landscapes.

Source: Author, 2023–2024.

5. Research Results and Discussion

5.1 Bridges Reflecting the Interactions between People and Rivers Driven by basic needs

Bridges reflect the interactions between people and rivers, driven by basic needs. This interaction pattern stems from the basic human need to cross river barriers, improve transportation, and promote economic development. Existing studies also generally believe that bridges not only span natural barriers but also carry a wide range of social functions. For example, Gohar and Kondolf studied the bridges on the Nile River. They pointed out that bridges are not only traffic channels, but also gradually evolved into public spaces, reflecting that humans are shaping the urban cultural landscape while meeting travel needs (Gohar & Kondolf, 2020). In their research on the value of urban bridges, Chang and Choo emphasized that bridges play a key role in the formation of cities. They are not only physical structures, but also the link of social interaction and economic connection (Chang & Choo, 2009). In the study area, this interaction mainly focuses on crossing barriers, settlement, urbanization, production, and economic activities.

Need 1, to overcome obstacles. The most basic function of a bridge is to cross natural obstacles such as rivers and connect the land, traffic, and people on both sides of the river. This demand stems from the basic desire of human beings for survival and development, making bridges the most direct product of interaction between people and rivers. The increase in traffic volume directly drives the demand for bridge construction.

Need 2, settlement and urbanization. The availability of water is an important reason for people choosing to settle near rivers. As the population continues to grow, urbanization has become an important way to meet people's housing needs. The needs of settlement and urbanization are intertwined, driving the change and development of cities as well as being the fundamental motivation for building bridges.

Need 3, demand for production and economic activity. Resources, markets, policies, supply chains, environment, and society are part of a complex system that comprehensively promotes the development of the regional economy, improving the overall economic efficiency by connecting important production areas and markets. Bridges connect farmland with markets, facilitate the transportation of agricultural products, and ensure the stability of food supply.

5.2 Bridges Participate in and Shape the Cultural Landscape along the River

5.2.1 Functions of bridges

Bridges connect different functional areas (such as communities, streets, farmlands, etc.) by allowing people to cross obstacles such as rivers and streets, achieving multiple functions like convenient transportation, community integration, and economic development. They are not only connectors of physical space but also play an important role in social, economic, and regional development.

Function 1: crossing the river and connecting the two sides. The primary function of a bridge is to cross natural barriers. Whether in a residential area, farmland, or commercial street, bridges enable easy communication between different functional areas.

Function 2: improving transportation and facilitating travel. Bridges directly connect communities with streets, farmlands, and other areas, providing convenient transportation channels that allow residents, pedestrians, and vehicles to quickly and safely traverse obstacles such as rivers and streets.

Function 3: promoting community and regional integration. Bridges connect communities, farmlands, and streets, improving traffic mobility in the region while also strengthening economic, social, and cultural interactions and promoting the integration of different social and functional areas.

Function 4: supporting agriculture and economic development. Bridges connect farmland and communities, facilitating the transportation of agricultural products and the circulation of production tools. This function is crucial for rural and agricultural areas since bridges provide important links between rural and urban areas, farmland, and markets, promoting the development of the agricultural economy.

Function 5: adaptability to multiple connection modes. Bridges connect residential areas, communities, streets (vertical and horizontal), farmland, etc. This demonstrates the versatility and flexibility of bridges in connecting different areas according to the needs of the population and their ability to adapt to different traffic and functional needs, whether in urban or rural areas.

5.2.2 The role of Bridges in Shaping the Cultural Landscape along Rivers

First, landscape transformation has been by the desire for convenient transportation. The construction of bridges not only has changed the traffic pattern along the river but also redefined the way in which space is used. With the construction of bridges, communities, villages, or farmlands that may have been isolated due to the river barrier have become more accessible, while the shortened traffic distance promotes the exchange of resources and people on both sides of the river. With the increase in population mobility, shops, markets, and even new residential areas also have developed rapidly near bridges, leading to a huge change in the cultural and economic landscape.

Second, bridges not only offer a means of transportation but also are important carriers for connecting different communities and cultures. Folk worship customs (Figure 8), markets, festival celebrations (Figure 9), and other activities can be held more frequently between the two sides of the river due to the existence of bridges, forming a community lifestyle landscape. These activities not only promote interaction and cultural exchange between residents on both sides of the river but also facilitate the integration and dissemination of lifestyles and cultural customs in specific regions. Bridge 1 in Figure 6, situated at the junction of the upper and middle sections of the Yongfeng River, has played an important role in shaping the cultural landscape of the upper reaches of the river. This bridge allows social and cultural activities to be conducted in the forest area and county town, and without it, the interaction between people and nature would be difficult. The river divides the county town into two parts, and the bridges along the river effectively connect the two major areas, promoting integration. Bridge 2 in Figure 6 is the largest in this river section; it also is the only bridge that can be used by vehicles and the only way to the Yunnan-Tibet Line (Jianchuan Section) of the Ancient Tea-Horse Road. It plays an important role in shaping the urban pattern and the city's image.

Third, enriching the historical and cultural landscape along the river. As shown in Figure 6, within the protection scope of Jianchuan Ancient City, bridges have participated in the shaping of the city's cultural identity and enriched the historical and cultural landscape along the river. Specifically, in the demarcation of historical and cultural blocks, Bridges 1 and 2 each play an important role. While serving as critical points between regions, they gradually have become local symbols and represent the regional cultural identity. As shown in Figure 2, the large number of cultural relics distributed throughout this area has resulted in it being the center of economic, administrative, and cultural activities in the county since ancient times. The old and new bridges are witnesses and participants of this historical and cultural landscape.

Fourth, enhancing the cultural and ecological value of agricultural landscapes. As shown in Figure 10, bridges provide important links in the development of the agricultural economy. They connect farmland with communities and cities, providing a convenient channel for agricultural production and consumption. This connection not only helps to integrate the agricultural economy into the broader urban economic system but also promotes the integration and development of the regional economy. As the efficiency of agricultural production improves, the agricultural cultural landscape around the village also continues to be developed. Farmland not only has the function of economic production but also forms part of modern ecotourism, enhancing the cultural and ecological value of the agricultural landscape.

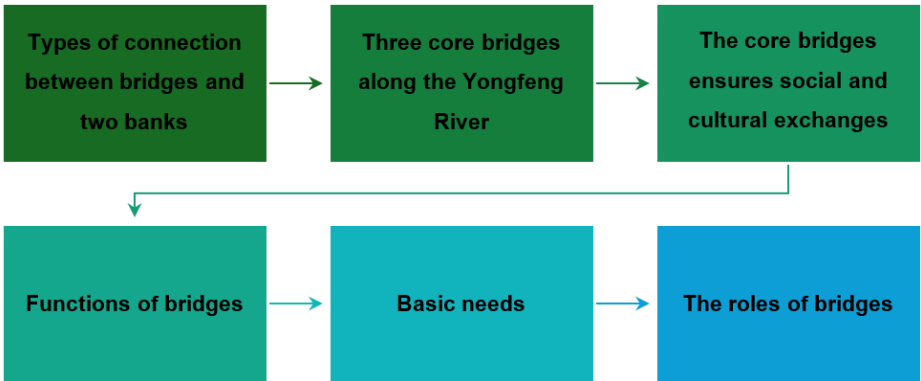


Figure 11. Summary of the research results.

Source: Author, 2024.

5.3 Bridge Construction and Heritage Protection pose a Challenge to the Government's allocation of Economic Resources

This study involved the collection of data on 52 bridges within 10.25 kilometers of the Yongfeng River, including nine road bridges, 29 community public bridges, and 14 private bridges. Except for two ancient bridges with high historical, artistic, and scientific value, the designs of most modern bridges tend to lack cultural and aesthetic characteristics. This shows that significant funds will be needed in the future for bridge construction and optimization in the area, but government resources are limited. The prioritizing of fund allocation also involves a trade-off between infrastructure construction and cultural heritage protection. Funds are required for the construction and maintenance of bridges, which may affect the allocation of funds for other cultural heritage protection projects. Especially when faced with a demand for bridge construction, a large number of simple bridges that only focus on economy and applicability likely are to destroy the original cultural landscape and visual integrity of historical relics and also may change the community's historical and cultural identity.

Therefore, the classification of bridges and connections between the two banks will aid the understanding of the needs, functions, and values of bridge construction in different river sections of the area. In particular, the discovery of core bridges will help reduce the excessive consumption of government economic resources to weigh the priority of fund allocation and maximize the efficiency of resource allocation.

5.4 Reduction in the Function and value of Historical Bridges and the Potential of new Bridges

The two simple bridges with cement and steel frame structures in Figure 12 are the last two bridges along the Yongfeng River in the transition zone between the county town and rural area, about 300 meters from the ancient Yongfengxi Bridge. There are farmlands on the same side of the two bridges, and the community on the other side has expanded outward on a large scale. Compared with the ancient arch bridge, the simple bridge is more adaptable to modern farming needs and more cost-effective to construct. This shows that the ancient Yongfengxi Bridge can no longer meet the needs of people in the extended new community, but the simple design of the modern bridge and its wide influence in the region may adversely impact people's cultural and historical memory of the ancient bridge.

● Type-3 Farmland — River and Bridge — Street — Community



Figure 12. Comparison diagram of the new and old bridges on the river section of Xiadeng Village.

Source: Map taken from Apple Maps. Photos of the bridge taken and marked by the author.

Based on an analysis of the connection between the bridge and two banks and the core bridge, Bridge-3 (Figure 6) clearly plays an important role in shaping and interpreting the cultural landscape. Urban expansion has led to the gradual reduction of the original function of the ancient bridge, but the modern bridge on the same river section may become a new city image or landmark. Just like its “predecessor,” the ancient Yongfengxi Bridge, it has survived at this special location for at least 200 years (officially identified as a Qing Dynasty relic by Jianchuan).

6. Conclusion

As an important medium for interaction between people and nature, a bridge demonstrates the basic functions of crossing natural barriers and meeting production and living needs and also reflects the diverse modes of interaction between people and rivers. In this study, the connection between bridges and the two river banks mainly is manifested into five types (Figure 4). The bridge types reflect the interaction mode between people and rivers driven by basic needs. This interaction is mainly concentrated on three aspects: the need to cross barriers, the need for settlement and urbanization, and the need for production and economic activities.

The functions of the bridges in this area mainly are reflected in crossing the river to connect the two banks, improving transportation and convenience, promoting community and regional integration, supporting agricultural and economic development, and increasing the adaptability of multiple connection modes.

Bridges deeply participate in and shape the cultural landscape along the river through their connection functions. The connecting role of bridges ensures local socio-economic development and the continuation of socio-cultural activities. Among them, three bridges, as geographical and cultural connectors, play important roles in shaping and maintaining this special cultural landscape within the study area. In this process, convenient transportation has brought about a change in the landscape. Bridges have become an important carrier for connecting different communities and cultures, enriching the historical and cultural landscape along the river, and effectively enhancing the agricultural landscape and cultural and ecological values.

This study is based on primary research data, and through the three steps of Open Coding, Axial Coding, and Selective Coding of grounded theory, the qualitative data have been thoroughly analyzed, with a theoretical model of cultural landscape interaction being constructed in a specific area with bridges as the theme (Figures 1 and 11). This theoretical model allows the connotation of the cultural landscape of the area to be interpreted, ensuring the effective protection and inheritance of historical bridges in the process of modernization while also providing a data reference for optimizing future bridge design and urban space layout.

There are few existing studies on the construction, maintenance, and evolution of bridges in the study area. In particular, the design concepts, social functions, and cultural values of early bridges lack detailed descriptions. The existing literature and archival materials are scattered and may only record certain specific periods or events in the form of folk tales. This makes it impossible to thoroughly explore the historical logic of the formation of the area's cultural landscape in terms of bridge history, resulting in a possible lack of coherence.

The bridge and cultural landscape cases selected for this study mainly are concentrated in specific geographical areas and cultural backgrounds. However, the research results have not been fully tested for effectiveness in this area. This limitation may affect the credibility and practical application value of the research results. In addition, although this selection allows the interactive relationship between bridges and cultural landscapes in this area to be thoroughly analyzed, it also brings potential limitations to the applicability of the research results for other regions.

These limitations may affect the depth of analysis and universality of the research results. Although the study has specific regional and validity limitations, future research may include: 1) further study on the distribution characteristics of other bridges in Jinhua Town, Jianchuan County (Figure 1), including the continued exploration of the interaction patterns between people and rivers under the same cultural background and different geographical environments. 2) increasing the number of case studies on bridges and cultural landscapes in different geographical and cultural backgrounds. By summarizing the experience of specific regions, the commonalities and differences across regions and cultures may be revealed through comparative analysis to expand their universality and credibility. 3) constructing a more abstract and universal cultural landscape interaction theoretical model capable of adapting to different geographical and cultural conditions.

Finally, due to the lack of historical documents related to bridges in the study area, this research mainly relies on geospatial primary data related to bridges and cultural landscapes. However, this is a doctoral research project led by an individual. Due to the limitation of resources, technology, equipment, funds, and team members, the lack of relevant technology and experience in the visualization of geospatial data may limit the efficiency and effectiveness of data presentation.

Author Contributions

Conceptualization, F.Z.; methodology, F.Z.; reviewing and formal analysis, F.Z.; writing- original draft preparation, F.Z.; writing-review and editing, F.Z., I.B.; visualization, F.Z. All authors have read and agreed to the published version of the manuscript.

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