

# Evolution of Landscape Patterns in Water-Land Intermodal Transport on the Southwest Silk Road during the Tang and Song Dynasties and Mechanisms of Cultural Exchange

Zeng Jing Zhi<sup>1</sup>, Wen Zhi Yuan<sup>2\*</sup>

<sup>1</sup>College of Fine Arts and Calligraphy, Sichuan Normal University, Chengdu, China

<sup>2\*</sup>Corresponding author: College of Fine Arts and Calligraphy, Sichuan Normal University, Chengdu, China

---

**Abstract:** This study investigates the water-land intermodal transport system of the Southwest Silk Road during the Tang and Song dynasties (7th–13th centuries), focusing on the dynamic evolution of its landscape patterns and the underlying mechanisms of cultural exchange. Against the backdrop of the "Belt and Road" initiative, the integrity and spatial narrative of linear cultural heritage have gained increasing prominence. However, the spatial structure and cultural functions of the Southwest Silk Road—a critical corridor connecting Southwest China with South and Southeast Asia—have not yet been sufficiently interpreted through a spatial lens. Employing an interdisciplinary approach that integrates historical document analysis, archaeological data synthesis, Historical Geographic Information Systems (HGIS) spatial analysis, and field surveys, this research reconstructs the constituent elements, spatial organization models, and evolutionary trajectories of the water-land intermodal system during the Tang and Song periods. Furthermore, it explores the roles and mechanisms of nodes at different hierarchical levels in facilitating cultural dissemination. The findings reveal a significant transition from a linear, military-administrative dominated pattern in the Tang Dynasty to a networked, commerce-driven hierarchical structure in the Song Dynasty. This evolution underscores the system's adaptive wisdom in responding to complex geographical constraints and shifting socio-economic demands. Crucially, the study elucidates how key nodes such as wharfs, markets, and postal stations served not merely as logistical hubs but as vital media for cultural osmosis, enabling the flow, adaptation, and reconstruction of diverse cultural elements across regions. By constructing a tripartite analytical framework of "landscape pattern—spatial mechanism—cultural process," this paper offers a comprehensive understanding of the Southwest Silk Road's dynamic spatial scenery and its intrinsic cultural logic, providing theoretical foundations and practical references for the holistic protection and utilization of linear cultural heritage in the contemporary era.

**Keywords:** Southwest Silk Road, Water-Land Intermodal Transport, Evolution of Landscape Patterns, Cultural Exchange, Tang and Song Dynasties, Historical Landscape

---

## 1. Introduction

### 1.1 Research Background and Problem Statement

#### 1.1.1 The Significance of Linear Cultural Heritage Research under the "Belt and Road" Initiative

In the macro context of the deepening implementation of the "Belt and Road" initiative, the Silk Road, as a pivotal historical channel connecting Eastern and Western civilizations, has seen its cultural heritage value increasingly highlighted. Consequently, research into linear cultural heritage has emerged as a core agenda for cross-regional and cross-cultural heritage protection and interpretation<sup>[1]</sup>. The Southwest Silk Road, serving as a traditional corridor linking China's southwestern hinterland with South and Southeast Asia, was not merely a conduit for ancient migration, material circulation, and technological diffusion. Rather, it constituted a complex spatial system integrating natural topography, artificial engineering, and social interaction<sup>[2]</sup>. As the perception

of cultural heritage shifts from static preservation to dynamic evolution, there is a growing emphasis on the overall structure, spatial continuity, and adaptive changes of traffic corridors over long time spans.

However, existing research has predominantly focused on route verification and artifact typology analysis, lacking a systematic overview of the spatial organization logic of the Southwest Silk Road as a complete cultural ecosystem. In particular, the structural characteristics of the synergistic operation of water and land routes in mountainous environments have often been overlooked. This research gap constrains the restoration of the authentic historical picture and affects the grasp of spatial continuity and functional connectivity in contemporary heritage conservation. The unique geographical environment of Southwest China dictated that its transportation system was not a simple extension of land routes but a composite system relying on both mountains and rivers, where water and land modes complemented each other<sup>[3]</sup>. Therefore, it is imperative to adopt a holistic perspective to deeply explore the spatial composition and pattern evolution of the water-land intermodal system on the Southwest Silk Road during the Tang and Song dynasties. This involves revealing how specific landscape forms were shaped under the dual influence of natural constraints and social demands, and further analyzing the mediating role of this dynamic spatial structure in cultural exchange.

### **1.1.2 The Shift in Focus towards Historical Landscape Dynamics and Cultural Connotations**

In recent years, the cognition of historical space has gradually broken through the limitations of static formal description, turning towards a comprehensive interpretation of the dynamic evolution processes of landscapes and their profound cultural connotations<sup>[4]</sup>. Traditional studies often focused on isolated analyses of site morphology or architectural styles. In contrast, contemporary scholarship emphasizes the generative mechanisms of space as a carrier of human-land interaction, social engagement, and cultural memory. It pays close attention to how spaces respond to multiple forces—natural conditions, technological advancements, and social transformations—over extended periods. Especially under complex terrain conditions, the formation of traffic corridors was not a simple artificial linear extension but a systematic spatial practice wherein humans adapted to the environment, organized resources, and constructed connections.

The Southwest region, characterized by high mountains, deep valleys, and intricate river systems, made water-land intermodal transport a key organizational mode for ancient traffic<sup>[5]</sup>. The layout of nodes, selection of paths, and functional evolution of this system all reflected a high degree of spatial wisdom and cultural adaptability. This perspective requires researchers to transcend the formal recording of single relics and instead focus on the overall structure of traffic networks, the correlations between elements, and their morphological changes across different historical stages. Simultaneously, cultural connotations are no longer viewed as abstract symbols attached to material objects but are embedded in spatial sequences, place atmospheres, and usage practices, realized through specific venues such as markets, wharfs, and postal stations. Therefore, research on the Southwest Silk Road during the Tang and Song dynasties must delve into the spatial organization logic of water-land transfer nodes, the interactive relationships between traffic routes and settlement distributions, and how these dynamic patterns carried and promoted the exchange and reconstruction of diverse cultures.

### **1.1.3 Weaknesses in Current Research on Landscape Dimensions and Spatial Integrity of the Southwest Silk Road**

Although considerable achievements have been made in current research on the Southwest Silk Road, most efforts remain concentrated on historical document verification, route restoration, and artifact typology analysis. Attention to the landscape dimension and spatial integrity of traffic corridors remains insufficient. A vast amount of research focuses on the orientation and node positioning of land channels, often neglecting the

critical role of waterway systems in complex mountainous environments. This leads to a lack of systematic understanding regarding the mechanisms of water-land intermodal transport, the functions of transfer nodes, and their structural status within the overall network. This tendency to "prioritize land over water" results in a fragmented spatial picture of the transportation system, making it difficult to restore how ancients dynamically connected and selected paths by relying on river channels and land shortcuts in actual travel.

Moreover, existing studies often take isolated city sites, passes, or tombs as objects of analysis, lacking a systematic review of the overall pattern of corridors. They fail to reveal the functional associations, hierarchical structures, and spatial organization logic between routes and nodes <sup>[6]</sup>. Particularly during the Tang and Song dynasties, as border governance deepened and regional trade developed, the transportation network in Southwest China evolved from a linear series to a multi-centered network. However, the specific spatial manifestations of this process and its impact on cultural flows have not been fully elucidated. Furthermore, discussions on cultural exchange mostly stay at the level of listing material contents, rarely analyzing what spatial carriers they relied upon or through which types of nodes transmission and fusion were achieved <sup>[7]</sup>. Therefore, it is necessary to break through the fragmented and planar research paradigms. Starting from the integrity of the landscape, we must reconstruct the spatial structure of the water-land intermodal system on the Southwest Silk Road, identify the internal logic of its pattern evolution, and provide research pathways for a deeper understanding of the dynamics and cultural functions of historical traffic corridors.

## **1.2 Research Objectives and Significance**

### **1.2.1 Research Objectives**

This study aims to systematically restore the evolutionary context of the landscape patterns of the water-land intermodal system on the Southwest Silk Road during the Tang and Song dynasties and to deeply interpret its spatial mechanism as a cultural carrier. Through a comprehensive analysis of historical literature, archaeological data, and geographic information, the research focuses on the composite transportation network of the period, with water systems such as the Min River, Jinsha River, and Nanpan River serving as arteries, and land routes like the Five-Foot Road and Shimen Road acting as bonds. It seeks to sort out the spatial distribution and functional evolution of water routes, land channels, transfer nodes, and ancillary facilities.

The research concentrates on the transformation process from the linear series pattern dominated by military and administrative control in the Tang Dynasty to the networked and hierarchical structure driven by commercial prosperity in the Song Dynasty. It aims to reveal the shaping effects of multiple factors—including natural geographical conditions, engineering technology levels, central governance strategies, and regional economic dynamics—on the spatial organization of traffic. On this basis, the study further explores how the water-land intermodal system transcended its mere function of material transportation to become a spatial medium for multicultural exchange and integration. By analyzing the specific roles of key nodes such as wharfs, markets, and postal stations in personnel movement, commodity circulation, technological dissemination, and belief interaction, the research parses how cultural elements achieved cross-regional flow via the transportation network and underwent adaptation, transformation, and reproduction in spaces of different levels. Ultimately, the goal is to construct a tripartite analytical framework of "landscape pattern—spatial mechanism—cultural process." This framework not only restores the dynamic spatial scenery of the Southwest Silk Road during the Tang and Song periods but also reveals its intrinsic cultural logic and spatial wisdom <sup>[8]</sup>.

### **1.2.2 Research Significance**

The theoretical significance of this study lies in expanding the spatial dimension of Southwest Silk Road research. It restores traffic routes from abstract historical lines to concrete landscape systems, emphasizing the structural value of water-land intermodal transport in mountainous environments. Simultaneously, the spatial mechanism system of cultural exchange constructed in this study contributes to a deeper understanding of ancient cross-regional cultural interaction processes, revealing how spatial structures influence the efficiency and direction of cultural dissemination.

At the practical level, this research provides support for the protection and utilization of linear cultural heritage in Southwest China under the "Belt and Road" context. By identifying key nodes and core corridors, it aids in formulating more targeted heritage conservation strategies, avoiding the fragmentation tendency in protection work. Furthermore, the study of water-land intermodal landscape patterns can offer historical references for the planning and design of contemporary cultural tourism routes. This promotes the spatial narrative and public interpretation of cultural heritage, achieving an organic integration of historical value and modern functionality.

## **2. Literature Review**

The Southwest Silk Road, as an ancient channel connecting China's southwestern hinterland with South and Southeast Asia, has seen its historical value and cultural connotations increasingly highlighted against the backdrop of the "Belt and Road" initiative. Existing research mainly concentrates on three dimensions: historical route verification, cultural heritage protection, and spatial analysis. These studies provide a solid theoretical foundation for this paper's exploration of the evolution of water-land intermodal landscape patterns and cultural exchange mechanisms during the Tang and Song dynasties, yet several limitations remain to be overcome.

### **2.1 Historical Geography and Route Verification Research on the Southwest Silk Road**

Traditional historical geography research on the Southwest Silk Road has yielded fruitful results, primarily focusing on route restoration and political-military function analysis. Scholars such as Hansen and Frankopan have sorted out the evolution of the Silk Road from a macro-historical perspective, emphasizing its role as a bond in world history. Regarding the Southwest China region, Yang and Wang have deeply explored the geopolitical and diplomatic relations during the Tang and Song periods, pointing out that the Southwest channel during this era was not merely a trade line but also a political line for dynastic border management. Ma Qiang specifically analyzed the geographical cognitive value of historical records from the Tang and Song dynasties in the Southwest, while Xingang focused on the long-term development of tea-horse trade between the Han and Tibetan peoples. However, existing research tends to emphasize the verification of land route orientations, often treating waterways as appendages to land routes. This approach neglects the structural characteristics of "water-land intermodal transport" as an independent transportation system in the mountainous environment of Southwest China, leading to a fragmented understanding of the integrity of the transportation network.

### **2.2 Linear Cultural Heritage and Landscape Spatial Analysis Methods**

With the update of cultural heritage protection concepts, the research perspective has gradually shifted from static sites to dynamic landscape corridors. Li Xue et al. reviewed the research progress on cultural landscapes of traditional villages, emphasizing the need for holistic attention to cultural ecosystems. Sigley and Li, taking the Ancient Tea Horse Road as an example, proposed methods for identifying cultural heritage corridors through multidimensional network connectivity analysis. Zeng et al. and Shen et al. further utilized

spatiotemporal dynamic analysis to explore the evolution laws of ancient trade and settlements, as well as the spatial patterning of UNESCO heritage sites. In terms of technical methods, Wenlong et al. attempted to reconstruct ancient transportation networks using machine learning and complex network theory, while Yue et al. and Lin constructed frameworks for heritage corridor systems. These studies provide methodological support for this paper. However, most of them focus on the Tea Horse Road of the Qing Dynasty or modern times. Quantitative analysis of the spatial organization models of the water-land intermodal system during the Tang and Song dynasties remains insufficient, and there is a lack of fine restoration of the long-term evolutionary trajectory of landscape patterns.

### **2.3 Research on Cultural Exchange Mechanisms under Transportation Networks**

Regarding how traffic corridors carry cultural exchange, academia has launched multidimensional discussions. Elias analyzed artistic exchange and transmission on the early Southwest Silk Road of China, while Xi et al. studied the cultural landscape characteristics of the Tang Poetry Road based on text mining. At the level of architecture and settlements, Gao et al. and Wu explored the spatial siting principles of religious buildings and postal facilities. Yin et al. and Qian et al. analyzed the spatial characteristics of Tang and Song cities and folk houses through space syntax and structural visualization. Although existing research has revealed the cultural dissemination functions of nodes (such as temples and postal stations), it mostly treats cultural elements as static attachments. It fails to fully elucidate the dynamic mechanisms of water-land transfer nodes (such as wharfs and markets) as "media" in cultural flow. In particular, the spatial process of cultural acceptance and reconstruction driven by commerce during the Tang-Song transition period remains unclear.

### **2.4 Research Critique and Entry Point of This Study**

In summary, current research has accumulated substantial depth in the historical context, spatial methods, and cultural interpretation of the Southwest Silk Road. Nevertheless, deficiencies such as "prioritizing land over water," "emphasizing static over dynamic," and "separating time and space" persist. Most studies have not regarded water-land intermodal transport as a co-evolving composite system, and there is a lack of comparative analysis on the differences in landscape patterns caused by changes in political and economic systems between the Tang and Song dynasties.

Based on this, this paper intends to focus on the water-land intermodal system of the Southwest Silk Road during the Tang and Song dynasties on the foundation of existing research. First, it utilizes Historical Geographic Information Systems (HGIS) to integrate multi-source data, restoring the spatial organization mode of water-land synergy to compensate for the perspective deficit of single land route studies. Second, it compares the evolution of landscape patterns under Tang military-administrative dominance and Song commerce-driven conditions to reveal their dynamic adaptive wisdom. Finally, it deeply analyzes the media mechanisms of nodes such as wharfs and markets in cultural exchange, exploring the adaptation and reconstruction of cultural elements in space. This study aims to provide new theoretical bases and practical references for the holistic protection and value interpretation of linear cultural heritage through a perspective of spatiotemporal integration.

## **3. Methodology**

### **3.1 Interdisciplinary Research Methodology**

This study adopts an interdisciplinary approach combining historical document analysis, archaeological data synthesis, Historical Geographic Information Systems (HGIS) spatial analysis, and field surveys.

Firstly, through a systematic review of historical documents from the Tang and Song dynasties—including official histories, geographical treatises, travelogues, and local gazetteers—the research extracts textual records concerning traffic routes, postal station settings, pass distributions, and commercial activities to construct a foundational knowledge base of historical materials.

Secondly, it integrates archaeological excavation reports from Southwest China during the Tang and Song periods, using physical evidence to corroborate documentary records.

On this basis, HGIS technology is employed to process and overlay the spatial information derived from historical literature and archaeological data. Spatial analysis methods are primarily used to identify the topological structure, node hierarchy, and coverage range of the transportation network, thereby revealing the evolutionary trajectory of landscape patterns.

Finally, combined with field surveys, the research conducts on-site inspections of key node sites to verify the accuracy of spatial analysis results. This process also involves perceiving the spatial atmosphere and cultural memory of the places, ensuring that the research conclusions conform to historical logic while possessing a tangible sense of space.

### **3.2 Data Sources and Processing**

Research data are mainly sourced from three aspects:

1. **Historical Document Data:** Includes records on Southwest transportation found in classics such as the *Book of Tang*, *History of Song*, *Man Shu (Book of Barbarians)*, and *Taiping Huanyu Ji*.
2. **Archaeological Data:** Sourced from excavation briefs and academic papers published by cultural relic archaeology institutes, covering settlement sites and transportation facilities in Southwest China during the Tang and Song dynasties.
3. **Geographical Environment Data:** Includes modern high-precision terrain data, water system distribution maps, and land use maps, used to restore the natural geographical background of the historical period.

## **4. Findings**

### **4.1 Evolution of Landscape Patterns in Water-Land Intermodal Transport on the Southwest Silk Road during the Tang and Song Dynasties**

#### **4.1.1 The Tang Dynasty: A Linear Series Pattern Dominated by Military and Administrative Control**

During the Tang Dynasty, the landscape pattern of the Southwest Silk Road exhibited distinct characteristics of a linear series. The primary driving force behind this configuration was the central dynasty's military and administrative control over border regions [9]. Records in the *New Book of Tang: Treatise on the Southern Barbarians* state: "Gao dispatched adjudicator Cui Zuoshi to enter the Nanzhao barbarians, persuading them to submit to civilization to separate them from Tibetan assistance. In the ninth year of Zhenyuan, the Shimen Road was reopened. In the tenth year, Cui Zuoshi arrived at Yangjiemie City and allied with Yimouxun at Cangshan." Additionally, the *Biography of Wei Gao* in the *New Book of Tang* records: "Promoted to Inspectorate Grand Tutor, concurrently Commander-in-Chief and Prince of Nankang Commandery. The Emperor praised his merit and ordered a stele of merit to be bestowed upon him." These texts indicate that Wei Gao, the Jiedushi (Military Commissioner) of Jiannan, was stationed in Rongzhou (modern Yibin) and managed Nanzhao along the Shimen Road, erecting the "Stele of Merit of Gao."

In this stage, the construction of the transportation network primarily served military campaigns, the transmission of government orders, and tax collection. Consequently, in terms of spatial organization, it manifested as a linear structure with main trunk lines as the core, accompanied by postal stations and passes set

up along the route. Fan Chuo's *Yunnan Zhi* (Record of Yunnan) describes the terrain of the Shimen Road (Five-Foot Road): "The eastern cliff of Shimen has stone walls rising straight up ten thousand ren, overlooking the flow of the Zhuti River, which then drops hundreds of feet into the ground; only the sound of water can be heard, inaccessible to humans. The western cliff is also a stone wall, beside which there is a plank road, one step wide, slanting across for more than thirty li, half suspended in mid-air, precarious and dangerous." Here, the Zhuti River refers to today's Hengjiang (Guanhe), and Shimen refers to today's Doushaguan in Yanjin, Yunnan. This description highlights the terrain primarily used for pass control <sup>[10]</sup>.

Regarding waterways, natural river channels such as the Min River and Jinsha River served as traffic arteries. However, limited by shipping technology at the time, water transport was mainly used for short-distance transfer of bulk materials or passage through specific sections. According to Volume 2 of *Man Shu*, which records water conditions in Yunnan and southern Sichuan: "From Rongzhou (today's Yibin) southward, a ten-day journey reaches Shimen (today's Yanjin)... the waterway is treacherous and evil, with many shoals and gravel bars." This proves that although waterways existed in the region, they were perilous, confirming the limitations imposed by shipping technology.

On the land side, ancient roads such as the Five-Foot Road and Shimen Road were repaired and expanded, becoming the main channels connecting the Central Plains with the southwestern borders. The Tang Dynasty established a rigorous system of Jimi (loosely controlled) prefectures in this region. Traffic nodes largely coincided with administrative centers, forming a spatial model of "routes following prefectures"<sup>[11]</sup>. The *New Book of Tang: Treatise on Geography* records: "Jimi prefectures... all led by the Protectorate General... beyond the wild services, the lands are distant." This confirms that the Tang Dynasty established numerous Jimi prefectures in the Southwest, subordinate to the Protectorate General, with clear administrative hierarchies. Postal stations, as key nodes on the linear network, mainly undertook functions of information transmission and official reception. Their distribution density was closely related to administrative levels. The *Tang Liu Dian* (Six Statutes of Tang), Volume 5, Ministry of War, records: "For every postal station, one is placed every thirty li... those not on thoroughfare main roads are called lodges." This verifies the standardized setting (one station every 30 li) and functions of postal stations <sup>[12]</sup>.

This linear series pattern reflected a strong political orientation. The selection of traffic routes often prioritized strategic locations and control nodes rather than pure economic efficiency. Although water-land intermodal transport existed at this time, it was mostly a result of passive adaptation to terrain, lacking systematic planning and organization. In terms of landscape morphology, it appeared as narrow corridors extending along river valleys, with sparse settlement distribution on both sides and weak spatial continuity. Cultural exchange was mainly limited to official envoys and military movements, with folk commercial activities being relatively restricted.

#### **4.1.2 The Song Dynasty: A Networked Hierarchical Structure Driven by Commerce**

Entering the Song Dynasty, with the shift of the economic center to the south and the prosperity of regional trade, the landscape pattern of the Southwest Silk Road underwent a significant transformation, gradually evolving into a networked and hierarchical structure <sup>[13]</sup>. During this period, the rise of the tea-horse mutual market and the vitality of folk commerce shifted the function of the transportation network from military-administrative control to economic circulation, leading to an adjustment in the spatial organization model <sup>[14]</sup>. The *History of Song*, Volume 184, *Treatise on Food and Commodities*, records: "Established the Tea-Horse Office in Chengdu... all Sichuan tea was monopolized to trade for western horses." In the reign of

Emperor Shenzong (Xining era), the Song Dynasty officially established the Tea-Horse Office, implementing a monopoly on tea to exchange for western horses.

The status of the waterway system significantly improved. Advances in Song Dynasty shipping technology enhanced the navigability of rivers such as the Jinsha River and Nanpan River, making water transport the preferred choice for long-distance bulk cargo transportation. Water-land intermodal nodes became key hubs in the network. Wharf facilities were continuously improved, forming distribution centers centered around ports. Land channels became denser; in addition to main trunk roads, a large number of branch lines connecting production areas with markets emerged, creating a network system with broader coverage <sup>[15]</sup>.

The hierarchical structure of nodes became increasingly clear. Level 1 nodes were regional central cities, possessing both administrative and commercial functions, such as hub towns at the confluence of water and land routes. Level 2 nodes were important transfer wharfs and markets, undertaking cargo distribution functions. Level 3 nodes were grassroots postal stations and villages, serving local traffic needs. This hierarchical structure improved the overall efficiency of the transportation network and promoted the optimal allocation of resources over a larger scope. In terms of landscape morphology, it manifested as a network pattern radiating outward from core nodes, with denser settlement distribution and enhanced spatial continuity. Cultural exchange consequently became more frequent and diverse, with folk beliefs and craftsmanship spreading deeply through the commercial network.

#### **4.1.3 Spatial Organization Models of the Water-Land Intermodal System**

The spatial organization model of the water-land intermodal system on the Southwest Silk Road during the Tang and Song dynasties embodied the wisdom of humans adapting to mountainous environments. In high mountain and deep valley areas, land routes crossed mountain ridges while water routes followed the rivers, with the two connecting at specific nodes. This connection did not occur randomly but was based on comprehensive considerations of terrain slope, water flow velocity, and cargo types.

Transfer nodes were typically located at river confluences, open valley floors, or starting points of land shortcuts. These nodes were equipped not only with hardware facilities for docking ships and loading/unloading goods but also with supporting warehousing, markets, and service facilities, forming spatial units with composite functions <sup>[16]</sup>. In terms of spatial organization, they presented a sequential structure of "water trunk line—transfer node—land branch line." Water routes undertook long-distance, high-volume transportation tasks, while land routes solved the "last mile" connection problem; the two were complementary and symbiotic <sup>[17]</sup>.

Furthermore, seasonal changes also influenced spatial organization. Variations in water levels between dry and flood seasons endowed some nodes with seasonal functions, leading to dynamic adjustments in traffic routes. This elastic spatial organization model ensured the continuous operation of the transportation system under different natural conditions. In terms of landscape patterns, it manifested as string-of-beads node clusters distributed along water systems, connected by land routes to form an integral network. This arrangement both complied with natural terrain and met transportation needs <sup>[18]</sup>.

#### **4.1.4 Dynamism and Adaptive Wisdom Reflected in the Evolution of Landscape Patterns**

The evolution process of the landscape pattern of the water-land intermodal corridor on the Southwest Silk Road profoundly reflects the dynamism and adaptive wisdom of ancient societies in coping with complex geographical environments and diverse social demands. The transformation from the linear series of the Tang Dynasty to the networked development of the Song Dynasty reflects the continuous adaptability of the transportation system under the influence of multiple factors such as politics, economy, and technology.

Relevant research points out that linear cultural heritage is not a simple collection of isolated sites but an integral cultural landscape system composed of traffic paths, node settlements, and natural environments <sup>[19]</sup>.

Ancient people achieved effective overcoming of natural obstacles such as mountains and river valleys and optimal allocation of resources by flexibly laying out routes, building plank roads and bridges according to local conditions, and setting up functional nodes at different levels. This adaptability was not only reflected in the level of engineering technology but also in the dynamic response of spatial organization to commercial demands, ethnic interactions, and ecological conditions. Scholars point out that the spatial structure of cultural heritage corridors usually manifests as a hierarchical system of "nodes—corridors—networks," achieving the synergistic integration of cultural and ecological elements through spatial connections <sup>[20]</sup>. The evolution of corridors is not a superposition of static heritage but a diachronic result of continuous human-land interaction.

Therefore, recent heritage protection research has gradually emphasized understanding linear cultural heritage from the perspectives of regional integrity and system resilience. It advocates balancing ecological environment and social development in protection to achieve sustainable utilization of cultural landscapes <sup>[21]</sup>. This promotes a protection concept that respects historical accumulation and emphasizes system resilience. In the contemporary protection and utilization of linear cultural heritage, we should draw on its adaptive logic to promote the functional regeneration and value continuation of corridor spaces in modern transportation, ecological protection, and cultural inheritance.

## **4.2 Mechanisms of Cultural Exchange under the Landscape Pattern of Water-Land Intermodal Transport**

### **4.2.1 Node Spaces as Media for Cultural Dissemination**

In the water-land intermodal system, nodes such as wharfs, markets, and postal stations were not merely places for material transfer but also key media for cultural dissemination. These node spaces possessed high degrees of openness and fluidity, gathering people and information from different regions <sup>[22]</sup>. As the interface for water-land conversion, wharfs were often the first stop for foreign cultures entering the inland hinterland, where architectural elements or religious symbols of exotic styles often appeared earliest. Markets served as centers for commodity exchange and information communication; goods from different cultural backgrounds circulated here, driving the dissemination of aesthetic concepts and lifestyles.

Postal stations, as basic units of the official transportation network, although mainly serving official duties, also facilitated the penetration of official culture into local areas. During their stay at postal stations, postal runners, officials, and their entourage interacted with local residents, bringing Central Plains rituals, systems, and technologies to border regions. Through daily usage practices, these node spaces concretized abstract cultural elements into spatial forms and behavioral patterns, realizing the landing and rooting of culture.

### **4.2.2 Wharfs: Implantation of Religious and Visual Culture at the Water-Land Interface**

Wharfs (anciently called "Jin," "Bu," or "Bu") served as the physical junction points between water and land transport, often acting as the first station for foreign cultures entering the inland hinterland. On the Southwest traffic lines of the Tang and Song dynasties, important wharfs were mostly located at river confluences or starting/ending points of dangerous shoals, such as Rongzhou (today's Yibin, confluence of Min and Jinsha Rivers) and Jiazhou (today's Leshan, confluence of Min, Dadu, and Qingyi Rivers). Due to the high risks of ancient shipping, wharf spaces were often accompanied by strong religious prayer functions, making religious architecture a core element of the wharf landscape.

According to Volume 2 of Fan Chuo's *Man Shu* from the Tang Dynasty, the waterway south from Rongzhou was "treacherous and evil, with many shoals and gravel bars," leading boatmen to largely hope for divine protection. Therefore, large-scale religious landscape construction appeared at water-land nodes such as Lingyun Temple in Jiazhou (Leshan Giant Buddha). The carving of the Leshan Giant Buddha (started in the first year of Kaiyuan in the Tang Dynasty) coincided with the busy period of Southwest water transport. Its location at the confluence of three rivers served both as a religious symbol for suppressing water and as a visual symbol for water navigation marks. This landscape form of "giant statues facing the river" not only reflected the spread of Buddhist culture in Southwest waterways but also solidified religious beliefs on the necessary path of water-land intermodal transport<sup>[23]</sup>. Past merchants and envoys stopping here to worship objectively accelerated the upstream spread of Buddhist rituals and aesthetic concepts along the river. Furthermore, sacrificial buildings such as Dragon King Temples and Chuanzhu Temples often established near wharfs constituted a unique waterfront cultural landscape, marking the spatial superposition of Central Plains sacrificial rituals and local water god beliefs at traffic nodes<sup>[24]</sup>.

#### **4.2.3 Markets: Dissemination of Lifestyles and Aesthetics Driven by Commodity Exchange**

If wharfs were the gateways for cultural entry, markets were the crucibles for cultural infiltration. During the Tang and Song dynasties, with the establishment of the tea-horse mutual market system, official regulated markets and folk markets along the Southwest traffic lines flourished increasingly. These markets were not only places for material exchange but also public spaces where people from different cultural backgrounds came into direct contact<sup>[25]</sup>.

Song Dynasty historical materials, the *History of Song: Treatise on Food and Commodities*, record that during the Xining era, "the Tea-Horse Office was established in Chengdu... all Sichuan tea was monopolized to trade for western horses," and horse-buying fields were set up in Lizhou (today's Hanyuan) and Yazhou. In these node markets, Han tea, silk, and porcelain were exchanged for horses, medicinal materials, and furs from Southwest ethnic minorities. Fan Chengda of the Southern Song Dynasty, describing border trade in Southwest China in *Guihai Yuheng Zhi*, mentioned: "With the coming of barbarian horses, other goods also arrived... ingenious items were countless." This material exchange directly drove the dissemination of lifestyles. For instance, the custom of drinking tea spread from the Sichuan Basin to the Qinghai-Tibet Plateau and Yunnan regions via the Tea Horse Road, changing the dietary structures of local ethnic groups. Meanwhile, crafts such as brocade and silver ornaments from ethnic minorities entered the Central Plains through water-land intermodal transport, influencing the aesthetic tastes of the Song people.

The spatial layout of markets often featured characteristics such as "shops in front and workshops in back" or "markets set along the river." This open commercial spatial form promoted frequent interaction and fusion of intangible cultural elements such as language, clothing, and diet, forming a cultural landscape of "Han and Yi living together."

#### **4.2.4 Postal Stations: Penetration of Systems and Rituals in the Official Network**

Postal stations, as basic units of the official transportation network in the Tang and Song dynasties, although mainly serving document transmission and official reception, effectively promoted the penetration of official culture into border regions through their existence as "enclaves." The *Tang Liu Dian*, Volume 5, stipulated: "For every postal station, one is placed every thirty li." This system was adaptively promoted in the Jimi prefecture regions of Southwest China.

Postal stations were not merely physical lodging points but also display spaces for political rituals<sup>[26]</sup>. The architectural style, interior furnishings, and reception etiquette of postal stations all followed Central Plains

systems. When officials, envoys, and accompanying literati dispatched by the central government stayed at postal stations, the clothing rituals, poetry, and administrative systems they brought exerted a subtle influence on local residents. When the Tang Dynasty poet Du Fu lived in Southwest China, he recorded life in postal stations in many poems. For example, the scene of the military headquarters and postal station depicted in Su Fu reflected the presence of Central Plains scholar-official culture at border nodes. Furthermore, daily interactions between postal runners and local residents allowed Central Plains language (Mandarin), weights and measures, and technologies (such as papermaking and printing) to diffuse to surrounding areas through the postal station network. Thus, postal stations became an extension of the "royal transformation" space in the borderlands, strengthening the cultural influence of the central regime through institutionalized spatial practices.

#### **4.3 Path Guidance of Cultural Flow by Transportation Networks**

The structure of the transportation network directly influenced the path and direction of cultural flow. Under the linear series pattern of the Tang Dynasty, cultural dissemination mainly extended linearly along the main trunk roads, presenting obvious axial belt characteristics. The scope of cultural influence was relatively limited and strongly controlled by the authorities. Under the networked pattern of the Song Dynasty, cultural flow paths became more diverse, capable of penetrating deep into the hinterland through multiple branch lines, forming a multi-centered and multi-layered cultural dissemination network.

The water-land intermodal mechanism further optimized the efficiency of cultural flow. Water transport, with its low cost and large capacity, allowed bulk cultural carriers (such as books, porcelain, and building materials) to spread over long distances. Land transport, with its flexibility, was suitable for personnel movement and the circulation of small items. The combination of the two ensured that cultural dissemination possessed both breadth and depth <sup>[27]</sup>. For example, Buddhist beliefs might enter hub cities via water routes and then spread to remote mountainous areas via land branch lines, forming a complete transmission chain.

#### **4.4 Adaptation and Reconstruction of Cultural Elements in Space**

In the process of flowing via transportation networks, cultural elements did not undergo simple spatial replication but rather a dynamic process of adaptation and reconstruction. As "frontier zones" of cultural contact, traffic nodes' hierarchical structures determined the degree of acceptance and transformation methods of foreign cultural elements. In the water-land intermodal system of the Southwest Silk Road during the Tang and Song dynasties, node spaces at different levels conducted differentiated screening and modification of cultural elements. Ultimately, this resulted in regional evolutions in landscape forms, including architectural styles, settlement layouts, and decorative arts. This adaptation and reconstruction not only reflected the resilience of cultural dissemination but also promoted regional cultural innovation and development.

##### **4.4.1 Node Hierarchy and Differences in Cultural Acceptance**

Node spaces in the transportation network possessed obvious hierarchy, which directly influenced the mode of cultural reconstruction. Research indicates that Chinese historical urban systems and transportation networks usually present clear hierarchical structures, with nodes of different levels undertaking different political, economic, and cultural functions <sup>[28]</sup>.

Regional Center Nodes (Level 1 Nodes): Prefectural seats such as Chengdu Prefecture, Rongzhou (Yibin), and Lizhou (Hanyuan), serving as administrative and military centers, often retained more native cultural characteristics of the Central Plains. These cities were planned strictly according to official systems such as the Ying Shan Ling (Regulations on Construction). Ward-market systems, government office buildings, and ritual architecture (such as Confucian Temples and City God Temples) mostly followed Central Plains regulations.

However, due to their location at border convergence points, these centers also presented a pattern of multicultural coexistence. According to the *New Book of Tang: Treatise on Geography*, southwestern prefectures "were all led by the Protectorate General." The unity of the administrative system allowed Central Plains ritual culture to take root here, while simultaneously accommodating exotic elements brought by traveling merchants.

**Grassroots Nodes (Level 2 and 3 Nodes):** County seats, market towns, stockade forts, and wharf markets manifested more as the transformation and absorption of foreign elements by local culture. These nodes were far from political centers and less constrained by official systems, making spontaneous cultural fusion among the populace more significant. For example, the "horse-buying fields" and "regulated markets" established in Southwest China during the Song Dynasty, although managed by the government, often had surrounding settlement forms that conformed to local terrain and folk customs, forming cultural forms with local characteristics. This spatial differentiation of "centers maintaining orthodoxy and edges innovating" constituted the basic background color of the cultural landscape of the Southwest Silk Road.

#### **4.4.2 Technical Adaptation and Morphological Evolution of Architectural Landscapes**

The adaptation and reconstruction of cultural elements were most intuitively expressed in architectural landscapes. After traditional Central Plains timber-frame architectural technology was introduced to Southwest China, it was not completely copied but underwent localization modifications combining local climate, terrain, and materials.

**Adaptation to Climate and Terrain:** The Southwest region has a humid climate, many mountains and rivers, and frequent issues with snakes and insects. Fan Chuo, in Volume 4 of *Man Shu* from the Tang Dynasty, recorded local folk housing customs: "Houses... the noble cover with tiles, the humble with thatch," and described the Ganlan (stilted) architectural tradition of some ethnic minorities where "the upper part is for living, and the lower part for livestock." With the influx of Central Plains immigrants and technology, a fusion-style architecture emerged: it retained the beam-column system and bracket decorations of Central Plains timber frames while absorbing the local Ganlan moisture-proof structures and Chuandou (penetrating column) frameworks.

**Localization of Materials and Technology:** Archaeological discoveries from Song Dynasty tombs (such as Song tombs in Luzhou, Sichuan) reveal a large number of brick-chamber tombs imitating timber structures. Their bracket and eave details followed Song-style practices while incorporating local decorative motifs [29]. This evolution indicates that technological dissemination brought by transportation networks was not a one-way indoctrination but a recreation by craftsmen based on local stone and wood characteristics. Although postal stations and government office buildings strove for standardization, folk residences and market buildings more flexibly adopted a "suit measures to local conditions" construction strategy, forming architectural landscapes that combined Central Plains charm with Southwest characteristics.

#### **4.4.3 Localization and Reconstruction of Religious and Artistic Styles**

Religious statues and decorative arts were another important carrier for the reconstruction of cultural elements. During the Tang and Song dynasties, Buddhism and Taoism spread along the Southwest Silk Road, and their artistic styles incorporated local ethnic aesthetic characteristics and social life content during the dissemination process.

**Secularization and Ethnicization of Statue Styles:** Taking the Tang Dynasty's Leshan Giant Buddha and the Song Dynasty's Dazu Rock Carvings as examples, these religious landscapes located near traffic arteries, although originating from Central Plains Buddhist traditions, underwent significant changes in specific

expressions. Many statues in the Dazu Rock Carvings (such as the "Parents' Grace Sutra Transformation Scene") incorporated Song Dynasty secular ethics and life scenes, with clothing and object details possessing distinct temporal and regional characteristics. This change reflected the "secular reconstruction" of religious culture to adapt to the psychological needs of local believers when spreading through transportation networks.

**Fusion of Decorative Arts:** In the temple and folk house decorations along the Southwest Silk Road, one can see the coexistence of Central Plains dragon and phoenix patterns with plant and animal patterns of Southwest ethnic minorities. This mixing of decorative languages was precisely the result of long-term interaction among people from different cultural backgrounds in node spaces such as wharfs and markets. The transportation network not only provided a transmission channel but also offered a spatial arena for cultural collision, enabling artistic styles to constantly generate new meanings during flow.

## 5. Conclusion

### 5.1 Research Conclusions

Through an in-depth analysis of the water-land intermodal system on the Southwest Silk Road during the Tang and Song dynasties, this study draws the following main conclusions:

First, the landscape pattern of the Southwest Silk Road during the Tang and Song dynasties experienced an evolution from a linear series dominated by military and administrative control in the Tang Dynasty to a networked hierarchical structure driven by commerce in the Song Dynasty. This process reflected a transformation in regional development dynamics from political control to economic circulation.

Second, the water-land intermodal system was a key spatial organization model for adapting to the mountainous environment of Southwest China. The selection and layout of its transfer nodes embodied a high degree of spatial wisdom, achieving an effective balance between natural conditions and transportation needs.

Finally, the landscape pattern of water-land intermodal transport was not merely a channel for material transportation but also a medium for cultural exchange. Node spaces and transportation networks jointly constituted the carriers and paths of cultural dissemination, promoting the flow, adaptation, and reconstruction of diverse cultures in cross-regional spaces.

### 5.2 Innovations and Limitations

The innovation of this study lies in breaking through the limitations of traditional Southwest Silk Road research that prioritized land over water and lines over networks. It constructs an integral analytical framework for water-land intermodal landscape patterns and reveals the intrinsic connection between spatial structures and cultural mechanisms.

However, certain limitations remain in the research. Due to the incompleteness of historical materials, the specific orientations of some water routes and the functions of certain nodes still require further verification through archaeological excavation. Furthermore, the discussion on cultural exchange mechanisms is largely based on spatial logical deduction, lacking support from more micro-level social history materials. Future research could further combine methods such as oral history and ethnography to deepen the understanding of human activities and cultural interactions during historical periods.

### 5.3 Prospects and Suggestions

Based on the conclusions of this study, the following suggestions are proposed for the protection and utilization of linear cultural heritage on the Southwest Silk Road:

First, emphasize holistic protection by incorporating waterways, land routes, and transfer nodes into a unified protection system, avoiding fragmented protection that damages the spatial continuity of the heritage.

Second, attach importance to the revitalization and utilization of node spaces. Through functional replacement and cultural implantation, restore the historical vitality of key nodes such as wharfs and markets, making them windows for displaying Silk Road culture.

Third, strengthen the construction of spatial narratives. Utilize digital technology to restore historical scenes of water-land intermodal transport, enhancing public cognition and experience of heritage values.

In summary, the research on the water-land intermodal system of the Southwest Silk Road during the Tang and Song dynasties not only reveals the spatial evolution laws of historical traffic corridors but also provides important theoretical references and practical guidelines for the protection and inheritance of contemporary linear cultural heritage. In future research, we should continue to deepen the exploration of historical landscape dynamics and cultural mechanisms, promoting the development of cultural heritage research to deeper levels.

### References

- [1]. Hansen V. The Silk Road: a new history [M]. Oxford University Press, 2012.
- [2]. Elias H. The Southwest Silk Road: artistic exchange and transmission in early China [J]. *Bulletin of the School of Oriental and African Studies*, 2024, 87(2): 319-344.
- [3]. Paleolithic culture and human interactions on the Southwest Silk Road.
- [4]. Li Xue, Li Bohua, Dou Yindi, Liu Peilin. Research Progress and Prospect of Cultural Landscapes of Traditional Villages in China. *Human Geography*, 2022, 37(2): 13-22, 111.  
DOI: 10.13959/j.issn.1003-2398.2022.02.002.
- [5]. Ma Qiang. On the Historical Records of Southwest China in the Tang and Song Dynasties and Their Value in Geographical Cognition of the West [J]. *Journal of Historiography*, 2005, (03): 54-60.
- [6]. Sigley G. Reimagining the 'Central Plains' (Zhongyuan) and 'Borderlands' (Bianjiang): The cultural heritage scholarship of the Ancient Tea Horse Road (Chamagudao) of Southwest China[J]. *International Journal of Heritage Studies*, 2021, 27(9): 904-919.
- [7]. Li H, Jing J, Fan H, et al. Identifying cultural heritage corridors for preservation through multidimensional network connectivity analysis—A case study of the ancient Tea-Horse Road in Simao, China[J]. *Landscape research*, 2021, 46(1): 96-115.
- [8]. Meng L, Zhang B, Cao L. Establishing Linear Cultural Heritage Corridors by Integrating Cultural and Ecological Values: A Case Study of the Jinzhong Section of the Great Tea Road[J]. *Land*, 2026, 15(2): 293.
- [9]. Wang Z. *Tang China in Multi-Polar Asia: A History of Diplomacy and War*[M]. University of Hawaii Press, 2017.
- [10]. Yang B. *Between winds and clouds: the making of Yunnan (second century BCE to twentieth century CE)*[M]. Columbia University Press, 2014.
- [11]. Perdue P C. *China marches west: the Qing conquest of Central Eurasia* [M]. Harvard University Press, 2005.
- [12]. Hansen V. The Silk Road: a new history[M]. Oxford University Press, 2012.
- [13]. Ebrey P B, Walthall A, Palais J B. *East Asia: A cultural, social, and political history* [J]. (No Title), 2014.
- [14]. Xingang C. Investigation and Analysis of the Development of Tea-Horse Trade between the Hans and Tibetans during the Period of Early Tang and Late Qing Dynasties [J]. *Academic Journal of Humanities & Social Sciences*, 2022, 5(4): 112-118.
- [15]. Zeng Z, Shen C, Xu M. Historical insights into sustainable development: analyzing the spatiotemporal

- dynamics of ancient trade and settlements [J]. *Land*, 2024, 13(5): 701.
- [16]. Shen Y, Liu J, Han J, et al. Reconstructing the Silk Road network: insights from spatiotemporal patterning of UNESCO world heritage sites [J]. *Land*, 2024, 13(9): 1401.
- [17]. Wenlong L I, Schmöcker J D, Qureshi A, et al. Reconstructing the transport network of ancient China and its relationship to social networks [J]. *Transportation Research Procedia*, 2025, 82: 3664-3679.
- [18]. Shu B, Zhang H, Liu Y, et al. A study on the formation mechanism of ancient transportation routes based on explainable machine learning [J]. *npj Heritage Science*, 2025, 13(1): 616.
- [19]. Yue F, Li X, Huang Q, et al. A framework for the construction of a heritage corridor system: a case study of the Shu Road in China [J]. *Remote Sensing*, 2023, 15(19): 4650.
- [20]. Lin Z, Li B. Circuit theory-based cultural heritage corridor network development in Qin River Basin [J]. *npj Heritage Science*, 2025, 13(1): 385.
- [21]. Meng L, Zhang B, Cao L. Establishing Linear Cultural Heritage Corridors by Integrating Cultural and Ecological Values: A Case Study of the Jinzhong Section of the Great Tea Road [J]. *Land*, 2026, 15(2): 293.
- [22]. Frankopan P. *The silk roads: A new history of the world* [M]. Vintage, 2017.
- [23]. Xi X, An X, Zhang G, et al. Spatial patterns, causes and characteristics of the cultural landscape of the Road of Tang Poetry based on text mining: take the Road of Tang Poetry in Eastern Zhejiang as an example [J]. *Heritage Science*, 2022, 10(1): 129.
- [24]. Gao J, Wang J, Wang Q, et al. Spatio-temporal distribution characteristics of Buddhist temples and pagodas in the Liaoning region, China[J]. *Buildings*, 2024, 14(9): 2765.
- [25]. Xingang C. Investigation and Analysis of the Development of Tea-Horse Trade between the Hans and Tibetans during the Period of Early Tang and Late Qing Dynasties [J]. *Academic Journal of Humanities & Social Sciences*, 2022, 5(4): 112-118.
- [26]. Wu B, Tan L. Siting Principles of the Ancient Postal Buildings Under Environmental Constraints [J]. *Buildings*, 2025, 15(17): 3047.
- [27]. Zeng Z, Shen C, Xu M. Historical insights into sustainable development: analyzing the spatiotemporal dynamics of ancient trade and settlements [J]. *Land*, 2024, 13(5): 701.
- [28]. Yin L, Wang T, Adeyeye K. A comparative study of urban spatial characteristics of the capitals of tang and song dynasties based on space syntax [J]. *Urban Science*, 2021, 5(2): 34.
- [29]. Qian C, Wang T, Yu S. Structural visualization analysis applied to the preservation of architectural heritage: the case of stilted houses in southwest Hubei, China [J]. *Heritage Science*, 2024, 12(1): 1-16.

### Author's Profile

I am currently a Master's candidate in Environmental Design at Sichuan Normal University. During my graduate studies, I have focused on the protection of historical cultural landscapes, linear cultural heritage, and the spatial evolution of the Southwest China region.

My master's thesis, *The Evolution of Landscape Patterns and Cultural Exchange Mechanisms in the Water-Land Multimodal Transport System of the Southwest Silk Road during the Tang and Song Dynasties*, adopts an interdisciplinary approach. By integrating various research methods, this study explores how changes in transportation networks drove cultural exchange throughout history.

Guided by the belief that "history informs future design," I aim to continue deepening my work in uncovering and revitalizing Ba-Shu cultural landscapes. My goal is to contribute professional expertise to heritage conservation and rural revitalization efforts across Southwest China.