

Analysis of the Characteristics of Traditional Villages under the Influence of the Function of Baixing Ancient Road

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Abstract: As one of the Eight Passes of the Taihang Mountains, the formation and evolution of the villages along the ancient Bai Pass Road not only serve as a microcosm of regional historical and geographical changes but also provide a lens through which to study the interplay between ancient transportation systems and rural settlements. As a direct reflection of the ancient road's functions, its military and commercial roles, combined with the natural endowments of the area, have profoundly shaped the types of villages along its route, which are primarily categorized into three types: defensive, commercial, and agricultural. By analyzing the spatial forms and types of these villages, we can reconstruct how the ancient trail exerted its influence and control over the region through key villages, thereby deepening our understanding of the trail's cultural significance.

Keywords: Baixing Ancient Road; traditional villages; spatial characteristics

1. Introduction

In recent years, the culture of ancient trails has become a significant subject of study in fields such as architectural history and folk culture. As a major cultural heritage site in China, the Eight Passes of the Taihang Mountains hold significant academic research value and conservation importance^[1]. The Bajing Ancient Trail serves as a vital corridor for the dissemination of traditional village culture in Shanxi and Henan. To systematically explore the architectural cultural heritage of traditional villages along the Bajing Ancient Trail, it is essential to trace the origins of the regional culture that underpins this construction system^[2]. Traditional villages are an integral part of architectural culture, reflecting the distinctive characteristics of different ethnic groups and regions. The preservation of these structures is of great significance for the inheritance and promotion of traditional architectural techniques, as well as for fostering cultural diversity^[3]. At the same time, the preservation of traditional villages contributes to improving the quality of life for local residents. By enhancing and optimizing the functions of these villages, they can better adapt to the demands of modern life, thereby achieving a harmonious coexistence between tradition and modernity^[4].

2. The present situation of Baixing ancient road village

The Taihang Mountains stretch between the North China Plain and the Loess Plateau, serving as a natural barrier to north-south travel in ancient times. The Eight Passes of the Taihang Mountains are eight naturally formed strategic passages that traverse the provinces of Shanxi, Hebei, and Henan, forming the vital lifeline for military campaigns, trade, and cultural exchange throughout history. The Bai Xing Ancient Trail is situated at the junction of Huixian City in Henan Province and Lingchuan County in Shanxi Province. Its history dates back to the Spring and Autumn and Warring States periods, spanning 3,300 years to date^[5]. The trail spans approximately 250 kilometers, specifically covering Lingchuan County, Gaoping City, Changzhi City, Changzi County, and Huguang County in Jincheng City, Shanxi Province, as well as Huixian in Xinxiang City and Xiuwu County in Jiaozuo City, Henan Province. The natural environment is renowned for its majestic, rugged, and perilous terrain, showcasing the unique geological and topographical features of the Taihang Mountains^[6]. Leveraging the unique geographical location of the Taihang Mountains, the natural environment along the route features complex and diverse topography, distinct climatic characteristics, and abundant biological resources. These features constitute an indispensable part of the cultural heritage of the ancient trail^[7].

The traditional dwellings along the Baixing Ancient Road are an outstanding representative of the regional architectural culture in the Taihang Mountain area. It is a valuable material cultural heritage created by local residents for hundreds of years to adapt to the unique natural geographical environment and meet the functional requirements of the commercial road station^[8]. The formation and development of dwellings are closely related to the rise and fall of Baixing Ancient Road. During the Ming and Qing Dynasties, with Baixing becoming the main road of commercial exchanges between Shanxi and Henan, the villages along the line rose rapidly and developed into important commercial stations and material distribution centers. The prosperity of commerce and trade has promoted the construction of residential buildings along the route, which not only provides residence for local residents, but also derives a large number of building types such as shops, inns and chariot shops serving business travel. Therefore, these houses are deeply imprinted with the genes of commercial culture.

The research object of this paper is the traditional villages along the Baixing Ancient Road and the existing traditional residential buildings. Its architecture is closely dependent on the surrounding landscape, forming a lifestyle based on environmental respect and broad landscape. It is deeply bound to the military and commercial functions of the Baixing Ancient Road and is an important material carrier of the ancient road culture. Combined with the preservation status, residential integrity and representativeness of traditional villages along the ancient road, the villages along the Baixing ancient road were selected as research samples, focusing on typical settlements and dwellings of different terrains and different architectural types, including Pingdian Village and Yidoushui Village in Huixian County, Henan Province, Shuangdi Village and Baizhazhang Village in Lingchuan County, Shanxi Province, Xitianliang Village and Jiantou Village in Gaoping City, to ensure the representativeness and comprehensiveness of the research samples, and provide a solid foundation for the systematic study of the construction techniques of traditional dwellings along the Baixing ancient road^[9].

3. Environmental Factors Affecting the Baicheng Ancient Trail

3.1. Natural Factors

The Taihang Mountains run along the border between Shanxi and Henan provinces, featuring dramatic topographic variations and a complex array of landforms, including gorges, hills, terraces, cliffs, and mountain passes. Through strategic site selection, flexible spatial planning, and adaptive architectural design, the constraints of the terrain are transformed into resources that drive the development of the villages^[10]. Using ArcGIS geographic information software, we systematically extracted and analyzed 30-meter resolution Digital Elevation Model (DEM) data for the provinces and cities along the Bai Xing Ancient Trail. Analysis of the processed elevation and slope data reveals a significant gradient variation along the trail, with elevations ranging from several hundred meters to over 1,700 meters (Figure 1). The topographic slopes within the study area were classified into six categories (Figure 2): 0–5°, 5–10°, 10–15°, 15–20°, 20–30°, and 30–45°, to analyze the extent to which slope influences the distribution of villages along the Taihang Pass.

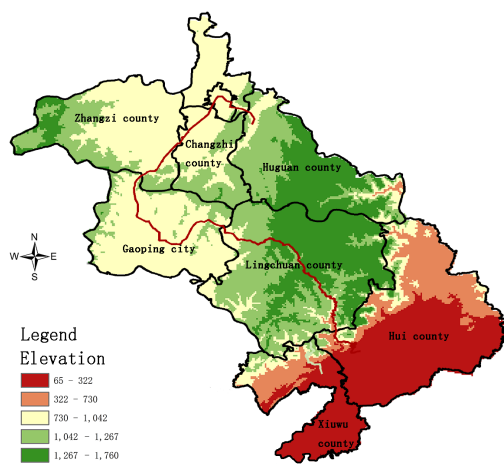


Figure 1: Elevation Analysis Map.

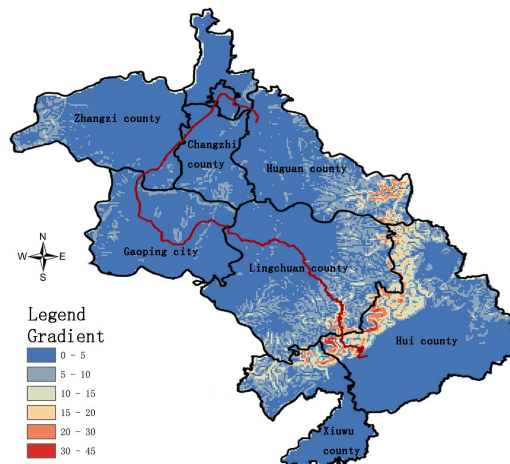


Figure 2: Slope Analysis Diagram.

Geographically, the ancient trail spans the boundary between the eastern edge of the Loess Plateau

(China's second topographic step) and the North China Plain (the third topographic step). The overall topography slopes from low in the southeast to high in the northwest, traversing three major topographic units from south to north: the transition zone from the Northern Henan Plain to low mountains, the Taihang Mountain range and canyon zone, and the transition zone from the Southern Shanxi hills to the plateau. Significant differences in topography and landforms across these sections directly influenced the route of the ancient trail, its construction methods, and the distribution patterns of settlements along the route. The topography and landforms along the ancient trail are categorized by section as follows (Table 1).

Table 1: Segmentation of Topography and Landforms along the Bai Xing Ancient Trail.

Division of Sections	Geographical Scope	Topographical Features	Elevation Range	Core Topographic Units
Southern Section (Southern Taihang Mountains)	Northern parts of Huixian and Xiuwu counties, Henan Province	The terrain is rugged, dominated by canyon landscapes, with slopes typically ranging from 15° to 45°. The mountains are steep, the canyons deep, and there are numerous cliffs and sheer walls	65~730 meters	Transition zone between the Northern Henan Plain and the low mountains
Central Section (Southern Shanxi Section)	Lingchuan and Gaoping, Shanxi	The terrain is gentle, consisting mainly of plains, low mountains, and hills, with slopes generally less than 10°. There are no distinct canyon landforms, and the landscape is open.	730~1,500 meters	Taihang Mountain Mid-Range Canyon Belt
Northern Section (Changzhi District)	Changzhi, Shangdang District, and Huguang, Shanxi	The terrain is gentle, consisting mainly of hills, plateaus, and flatlands, with slopes generally less than 20°. The loess layer is deep, the landscape is open, and low mountains are occasionally found	800~1,200 meters	The transition zone between the southern Shanxi hills and plateaus

3.2. Historical Development

The Ancient Bai Xing Pass was not merely a transportation route, but also a cultural corridor rich in historical and cultural significance. Its cultural significance is reflected in various aspects, including military affairs, commerce, and folk customs, and it held extremely important strategic value^[11]. Militarily, due to its unique geographical location, this pass allowed troops to cross the Yellow River to the south to attack Bian and Zheng, advance eastward to Heze and Daming Prefecture in Shandong, and look northward toward Anyang and Handan, making it a strategic military gateway that was both offensive and defensive. Throughout history, numerous major military campaigns have passed through Bai Xing, such as when Duke Zhuang of Qi led his army northward to conquer the State of Jin during the Spring and Autumn Period, and when Chinese forces utilized Bai Xing for troop movements and operations during the War of Resistance Against Japan. Commercially, it holds a significant position in the history of China's socio-economic development, serving as a vital trade route connecting the north and south and earning the reputation as the "Silk Road of the Taihang Mountains" and the "Ancient Tea-Horse Road." The ancient Bai Xing trail is entirely paved with stone. Depending on the steepness of the slope, stones are laid crosswise every 3–5 meters (as shown in Figure 3), slightly raised above the surface. This design not only enhances the road's durability but also facilitates drainage and prevents vehicles and horses from slipping. At its widest point, the trail is 3 meters wide, allowing two mule caravans to pass each other.



a. Baiqing Ancient Trail in Xiling Village



b. Baiqing Ancient Trail in Shuangdi Village

Figure 3: Baiqing Ancient Trail.

4. Types of Traditional Villages Along the Route

4.1. Commercial Villages

Commercial-type settlements are a type of residential settlement that developed based on the transportation functions of ancient trails, with their spatial layout closely tied to commercial activities. Such villages typically extend outward with the ancient trail as their central axis; their formation process exhibits distinct characteristics of spontaneity and is primarily driven by economic interests. In terms of spatial characteristics, these villages are generally modest in overall scale, yet feature dense concentrations of commercial facilities along both sides of the ancient trails, with well-developed service functions. The villages often adopt a linear layout following the course of the ancient trails, maximizing street-facing facades to enhance commercial value. The architectural layout follows the typical “shop-front, residential-rear” pattern, where street-facing buildings are predominantly shops with residential areas at the rear, while ordinary dwellings are distributed along side streets or alleys (Figure 4).



a. Former Site of Wanshengfang in Bo'bi Town



b. Street-facing shops in Nan Zhangdian Village

Figure 4: Street-facing shops.

In terms of spatial layout, these commercial-residential dwellings exhibit characteristics of clustering along roads and distinct axial alignment. Most dwellings are distributed linearly along one or both sides of the main route of the ancient Bai Xing Road, forming a “front shop, back residence” layout that integrates the ancient road, dwellings, and shops into a trinity (Fig. 5). The main alleys coincide with the ancient road and are of moderate width (2–3 meters), facilitating the passage of mules and horses as well as the transport of goods; Residential buildings line both sides of the streets and alleys, with shopfronts on the ground floor and living quarters on the upper floors, creating the classic layout of “commercial space below, living space above; shop in front, residence in back.” Some larger residences also feature additional storage space at the rear, integrating living, commercial, and storage functions. The overall layout is compact and orderly, emphasizing efficient use of space to avoid wasting limited land resources at transportation nodes.

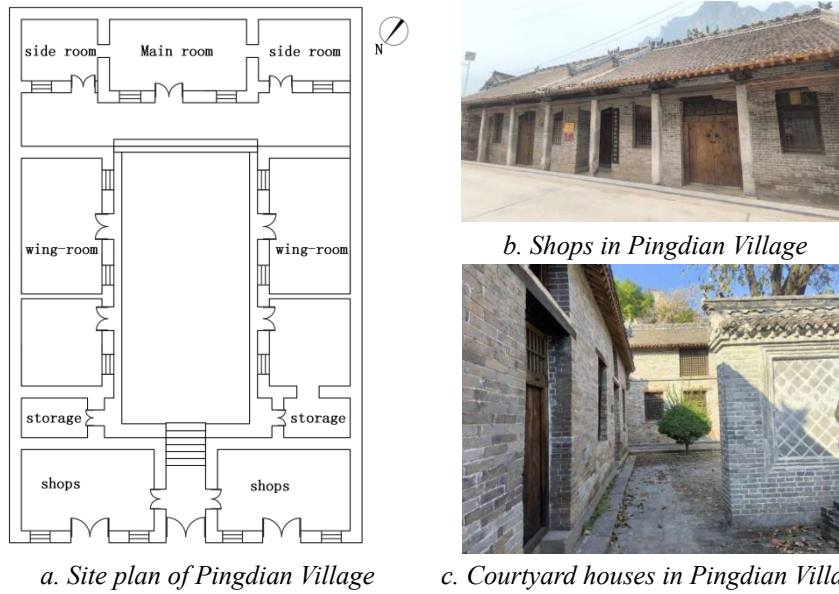


Figure 5: Residential buildings with shops at the front and living quarters at the back.

4.2. Agricultural Villages

Farming dwellings are human settlements with agricultural production as the main economic activity, and their formation and development are closely related to land farming. In terms of site selection, most of them tend to be flat, fertile soil and sufficient water sources, such as river valley plains and mountain basins, so as to facilitate reclamation of farmland and irrigation of crops. In terms of functional design, agricultural dwellings emphasize the integration of production and life, and a complete set of auxiliary space for agricultural production. The courtyard is the core space of agricultural dwellings, mostly open square or rectangular, which is convenient for drying grain, stacking farm tools and breeding livestock. On one side of the courtyard, a livestock shed and a grass room are set up to cultivate cattle, sheep, mules and horses. On the other side, a farm tool house and a granary are set up. The granary adopts moisture-proof, fire-proof and rat-proof structures to ensure food security. The main room is used for living and living, and the room is used for storing sundries or temporary living. Some houses will also set up a small vegetable garden in the corner of the courtyard to grow vegetables and achieve self-sufficiency (Fig. 6).



Figure 6: Farmhouse-style dwellings.

4.3. Defensive Villages

Based on the clear strategic needs of military defense, defensive villages often build cities on the basis of villages, forming relatively stable economic ecology and resource enrichment advantages. From the perspective of space construction, its site selection and construction mostly choose the back mountain water, easy to defend and difficult to attack, and use the natural terrain to build a natural defense line. Secondly, select the village with a certain historical accumulation as the base of the city, reduce the construction cost with the help of the original construction foundation, and continue the regional context. In terms of spatial layout, the village and the ancient post road form an intersecting or tangent spatial relationship, which not only guarantees the rapid circulation of military information and materials, but

also cuts off the traffic to block foreign enemies when necessary. Its overall pattern is square and orderly, and the streets are distributed in a chessboard shape. Through the city walls, gates and other facilities to strengthen the boundary, it forms an inward closed defense system, highlighting the strong military defense orientation and spatial security (Fig.7).

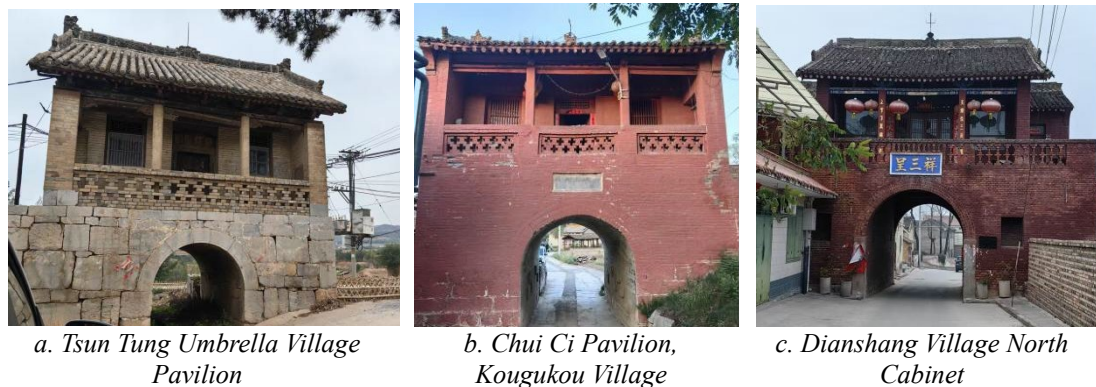


Figure 7: Guan Ge Schematic Diagram.

In terms of architectural style, defensive dwellings are primarily fortress-like (Fig. 8), emphasizing sturdiness, durability, and defensive capabilities. The overall design is simple and imposing, with minimal ornamentation, blending seamlessly into the surrounding mountainous landscape to create a fortress-like visual effect. The defensive walls are tall and majestic, giving the complex a solemn and robust appearance that exudes a strong sense of defense. At the same time, the architectural form is highly adapted to the natural terrain, built against cliff faces and steep slopes. The walls are constructed using local blue stone in a mortar-bound masonry technique; they are thick, dense, and difficult to breach. Parapets and lookout platforms are installed at the top of the walls to facilitate observation, while the roofs feature steeply pitched double-sloped stone slabs, designed to facilitate drainage and snow removal. Most individual structures are two or three stories tall. The ground floor is used to store weapons, grain, fodder, and other supplies; the middle floor serves as a garrison and sentry post for soldiers; and the top floor provides living quarters. There are few open spaces, and the doors and windows are small in size and positioned high up. Heavy wooden doors and stone windows are used to enhance defensive security.

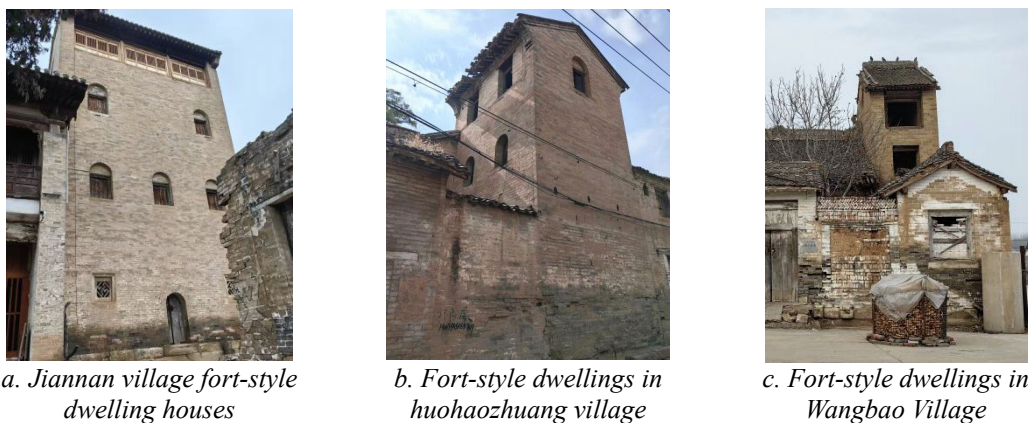


Fig. 8: Defensive dwellings.

5. Conclusions

According to the analysis results of the natural environment system along Baixing by ArcGIS software, villages are mostly formed in areas with relatively open terrain and gentle slopes along the ancient roads. Such areas can accommodate more residents, effectively guarantee the convenience of traffic passage, and provide basic conditions for the long-term development of villages. Commercial villages are mostly distributed in the transportation hub or node position of the ancient road. Relying on the commercial exchange function of the ancient road, a village form based on commodity trading and passenger and cargo transfer has been formed. Farming villages are distributed in areas with gentle terrain and fertile soil along the ancient roads. They are mainly based on agricultural production. The village layout meets the needs of agricultural production and pays attention to practicality and comfort. The

defensive villages are mostly located in the dangerous areas along the ancient road, relying on the mountain landform to form a natural defense barrier, and many of them have defense facilities to ensure the safety of the ancient road and the safety of villagers' living. The traditional villages along the Baixing Ancient Road have distinct distribution characteristics and morphological characteristics. The formation of these characteristics is not only a concentrated expression of Baixing's historical functions and regional culture, but also a product of the deep integration of living space and historical context in a specific historical period. The historical role of the ancient road directly affects the form and distribution of the node villages along the line, and the distribution and form of the villages are deeply integrated with the natural environment, which fully demonstrates the survival wisdom of the ancestors to adapt to the geographical environment and make use of the natural conditions. It is the comprehensive result of the interaction and coordinated development of geospatial environment and human factors.

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