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RESEARCH ARTICLE

From hinterland granary fort to frontier mountain fortress: Initiation, construction, and expansion of the Diaoyucheng Fortress, Hechuan, China, in the wars during 1125–1279

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Paradigm

Abstract The Southern Song planned and constructed the Diaoyucheng Fortress at Hezhou of the Sichuan Theatre, during the 13th century. This fortress became famous for its 36-year resistance against the Mongols and the death of Möngke Khan in 1259. Based on historical documents and data from re-analysis of archaeological report and field survey, this study explores its initiation, construction and transition, to build a coherent narrative for its transformation from a hinterland transport hub during the Song-Jin War (1125–1234) to a frontier stronghold during the Song-Mongol War (1235–1279), which experiences the establishment of Zhuanban Granary in the 1130s, the construction of Xinyuguan Fort in the 1160s–1170s, the transformation into a refuge in 1240, and the expansion into the Diaoyucheng Fortress in 1243–1279. By combining spatial analysis with military history, this study discusses how the peninsular site, the “dustpan” form, and the fort cluster were formed under the influence of military strategies in different war periods and the topography in Sichuan. With the comparisons with the fortifications across Eurasia around the same period, this study illustrates this fortress epitomizes the development of knowledge system for fortification design in ancient China, especially the river defense fortress taking advantage of topography and navy.

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1. Introduction

The Diaoyucheng Fortress in Hezhou of the Sichuan Theater¹ was a strategically important mountain stronghold built by the Southern Song to defend the northern nomadic regimes. Recognized by Yao Sui (1239–1314), an advisor to Kublai Khan, as one of the “Eight Columns,” this fortress played a crucial role in the Sichuan Mountain Fortress System (2004). Planned by Yu Jie (1199–1253), who served as the Sichuan Military Intendent from 1242 to 1253, the system included more than eighty fortifications (Song, 1976). The Diaoyucheng Fortress was located at the top of the Diaoyu Mountain on a peninsula, about 5 km from Hezhou city, which is now known as the Hechuan District of Chongqing today. Notably, its function transformed during wartime from a logistical hub to a temporary administrative and military center. In 1243, the local government and the military institution were relocated from the vulnerable city on the plains to the secure mountaintop fortress. The Diaoyucheng Fortress encompassed a significant area of 7.7 km² on the peninsula, accommodating a substantial population alongside a garrison of over 4600 troops, and they resisted the Mongols for 36 years until they surrendered to the Yuan in 1279 (Li, 1966). The Song armies defeated Möngke Khan in 1259, leading to his death and the collapse of the Mongol Empire. This historic event delayed the fall of the Southern Song and had a significant impact on the Mongol invasion of Eastern Europe (Yao, 1964; May, 2013). The fortress, therefore, stands as a testimony to the military strategies of Song and its design principle of the military architecture. Exemplifying the integration of natural landscape with defensive strategies, the Diaoyucheng Fortress presents the characteristic prevalent in East Asian fortifications during this period, which stands in contrast to the European fortifications emphasizing on artificial structures and techniques (Cho, 2012; K’uan-Chung and Wright, 2000; Wu, 2006) (see Fig. 1).

Since its rediscovery in 1942, the Diaoyucheng Fortress has captivated the attention of historians, archaeologists, and architectural historians. The masonry remains from the Song Dynasty have endured, encompassing fortification facilities, architectural stylobates, roads, water system, cliff inscriptions within the mountain fortress, and the naval port adjacent to the Jialing River. Systematic



Fig. 1 The Diaoyucheng Fortress on the riverside mesa landscape. Source: Zhang Yufei, 2023.

archaeological excavations have been underway for nearly three decades, with a focus on the fortress walls, naval ports, and architectures. However, exploratory efforts on the peninsula remain in their early stages. These findings were documented in *Collection of Reports on Archaeological Survey and Excavation of the Diaoyucheng Fortress Site* (CMRICRA and ADBSM, 2021). Historical research and archaeological evidence provide a foundational understanding for architectural historians regarding the spatial dynamics of the Diaoyucheng Fortress. According to Liu (2009), the fortress serves as a pivotal node within the Sichuan Defense System, characterized by a network of mountain fortresses along the rivers. Yao (1958) highlights that the Diaoyucheng Fortress and the old Hezhou city constituted a twin-city structure, addressing the logistical challenges of wartime. Yang observes that the strategic considerations influenced the wall layout of the Diaoyucheng Fortress, distinguishing its form from that of conventional cities on flat land (Yang et al., 2021). Meanwhile, Guo (2003) examines the development of this fortress, noting its construction on the site of the Huguo Temple on the Diaoyu Mountain.

Research on the Diaoyucheng Fortress evolved from broad historical and field investigations in the 1940s to more specialized inquiries within architectural history, archaeology, and military history by the 1980s, reflecting a diversification of disciplinary focus. In architectural history, the emphasis shifted towards discrete aspects like site selection, spatial configuration, and construction techniques. While the existing research has explored the spatial characteristics of the Diaoyucheng Fortress and its several construction phases spanning 36 years, the specific dates and design principles of its construction and planning, remain ambiguous (Tong, 2020). This challenge primarily arises from perceiving the Diaoyucheng Fortress as an isolated artifact rather than as an amalgamation of historical, cultural, and architectural elements. Furthermore, existing conclusions predominantly draw directly from summaries of

¹ The term “theater” in this context referred to a war zone. To oversee the vast borderlands between Song and the northern nomadic regimes, bounded by the Qinling Mountains and the Huai River, Song established three main theaters: the Sichuan (originally called Chuanshan), Jingxiang, and Jianghuai theaters. These theaters were administered by the Military Intendency, which had authority over local administrations and border garrisons. See Su, P., 2008. *The Military History of the Southern Song Dynasty*. Shanghai Classics Publishing House, Shanghai. pp. 330–342.

war descriptions in post-war historical documents and analyses of physical materials, lacking a comprehensive geo-military, political, cultural, and economic context as well as the interplay between its construction and these contexts. Indeed, fortifications are intricately integrated with the surrounding cultural landscapes, terrains, communities, and settlements in diverse manners (ICOFORT, 2021). They embody not only the evolution of military strategies and ordnance technologies (Sun and Xi, 2017), but also encapsulate historical, cultural, and ideological factors within the material world (Pollak, 2010). Their formation is a comprehensive process that involves devising defense strategies, initiating fortress construction, and organizing the construction efforts. The dual nature of fortification underscores the necessity for interdisciplinary research on the Diaoyucheng Fortress, as advocated by Fang (1944).

In fact, the planning and construction of the Diaoyucheng Fortress was more complex than it appears. Drawing from the vestiges of the mountain fortress and historical resources from the Southern Song Dynasty, including poetry, cliff inscriptions at the Diaoyu Mountain, and the *Dianjiangzhi segment* (《垫江志·残篇》)—a gazetteer of Hezhou penned by Ren Feng, the then governor during 1213–1217, approximately 80 years pre-Mongol invasion—it is posited that the Song court established a ferry, fortification, and the Zhuanban Granary (转般仓), a military storehouse, on the eastern peninsula beyond Hezhou city to provision the garrisons at the Qinling Defense Line (Fan, 1998; Ren, 2000; Yuan, 1998; Zhang, 1992). Archaeological excavations have also provided evidence for the early date (Tong, 2020). Such clues prompt inquiries into the timing and rationale behind the construction of the Diaoyucheng Fortress, its initial construction and subsequent evolution throughout the Southern Song Dynasty, and the strategic ingenuity that enabled it to bolster the Song's defense against the Mongols for an extended period of 36 years. To address the previously mentioned challenges, this study delves into historical documents from the Song Dynasty, aiming to provide the context on the military and political culture, alongside the geographical environment of the Sichuan Theatre of the Southern Song. It endeavors to recontextualize the initiation and development of the Diaoyucheng Fortress amidst the turmoil of the Song-Jin and Song-Mongol Wars in the 12th to 13th centuries. This study conducts a detailed analysis of the site selection, construction, and expansion of this fortress across distinct wartime phases, by combining the information from reanalysis on the archaeological report and field survey on the site with the historical documents. The design and construction issues are explored, such as the main planners, the construction organization, the source of land, and the planning intention subjected by defensive strategies and realistic conditions, to explain the formation and dissemination of the paradigm of the Diaoyucheng Fortress. Meanwhile, by contrasting with fortifications in medieval Eurasia, the spatial and design characteristics of the Diaoyucheng Fortress as a quintessential mountain stronghold in East Asia, are discussed. Furthermore, this research evaluates the significance of the Diaoyucheng Fortress through the lenses of military history and architectural history, highlighting its enduring legacy.

2. Methodology

The research on frontier fortresses, from the perspectives of Chinese military history and European military architecture, provides viable methodologies for this study.

The former approach integrates strategic cultural insights with fortification planning, to understand how the defense system is influenced by the strategies from different dimensions. Concentrating on the relationship between defense system planning and military logistics strategy, Cheng (2006) investigated the impact of logistical approaches and routes on the distribution and site selection for various fortification types along the frontier between Song and Western Xia in the 11th century. Zeng (2006), through the lens of strategic culture theory across four levels—grand strategy, regional strategy, tactics, and war technology—examined the influence of military and political ideologies of emperors, courtiers, and local generals on the construction of Song fortresses along the Song-Western Xia and Song-Liao borders. However, this methodology presents two primary limitations: it falls short in analyzing the integration process of fortifications within the local natural and cultural landscapes, particularly at the fortress scale. The exploration of European military architecture provides remedies. By initiating an analysis that encompasses three distinct yet interconnected dimensions—historical and cultural context, construction process, and physical spaces—architectural historians delve into the roles various stakeholders play in the construction and how they incorporate their needs and intentions into the fortification's design (Pollak, 2010). The influences of military culture, policies and local conditions on the specific typology and the form of architecture would be demonstrated in the research on military architecture.

By integrating military history perspectives with military architecture research methodologies, and utilizing the resources such as historical documents, official records, local chronicles, geographical historiographies, and new findings from field surveys and reanalyses of archaeological report, this study constructs a coherent narrative of the Diaoyucheng Fortress's planning and construction during the Song-Jin War (1125–1234) and Song-Mongol War (1235–1279). Drawing from extant research on strategies and warfare in the Song Dynasty, the evolution of the military logistics system in the Sichuan Theatre throughout the 12th and 13th centuries is illustrated. Contextualizing local conditions, this study discusses the rationale behind Xi Yi and other local officials and generals' decision to erect a logistical granary and fort at Hezhou during the Song-Jin War, including their criteria for site selection. By analyzing the physical forms and spatial features, and relating them to the defensive requirements prompted by the fluctuating war situations in Sichuan, this study examines the planning intentions behind the expansions and transformations of the Diaoyucheng Fortress under Gan Run, Yu Jie and other governors. This paper summarizes the construction patterns, spatial configurations, and planning principles of this Fortress, shaped by defense strategies, aiming to explore the existence of the Diaoyucheng Fortress paradigm and the fortification knowledge system of Song behind it. Additionally, the advantages of defense and planning in this

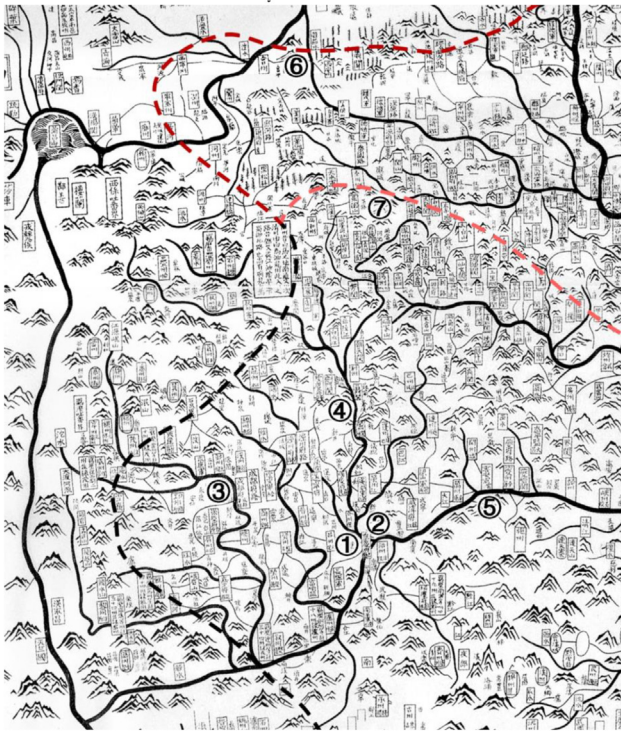


Fig. 2 Yuditu (Map of the Song Empire), anonymous, during 1265–1274 (① Hezhou, ② Chongqingfu, ③ Chengdufu, ④ Jialing River, ⑤ Yangtze River, ⑥ Song-Western Xia Border during the Northern Song Dynasty, ⑦ Song-Jin Border, the Qinling Defense Line, during the Southern Song Dynasty). Source: redrawn by Huang Wen; original figure from Cao, 1999.

fortress are presented in comparison with fortifications in Eurasia during the same period.

During the 10th to 13th centuries, following a 270-year period of turmoil, China experienced a division between its northern and southern regions that persisted for over three centuries. Zhao Kuangyin consolidated southern China under the Song Dynasty, whereas northern China successively fell under the dominion of the Liao, Jin, and Mongol dynasties (Barfield, 1989). Due to the loss of natural barriers, including the Yan Mountain and part of the Huang River, Song was unable to build fortifications at key geographical places to stop enemies. The strategy of establishing a perimeter defense, characterized by artificial landscapes, fortresses, and border garrisons, supported by a logistical system, became a general defensive strategy for Song (Tackett, 2017) (Fig. 2). Accordingly, the military logistics assumed a pivotal role in warfare, a notion underscored in treatises by Song military strategists, notably *Hu Qian Jing* (《虎钤经》) by Xu Dong (1935), and *Suggestion of Cuiwei Northern Expedition* (《翠微先生北征录》) by Hua Yue (2005). On the other hand, with the decline of the Northern Song and the contraction of the Southern Song's territory in the 12th century, this strategy began to incorporate river systems, giving rise to a river defense strategy (Huang, 2016).

Scholars have analyzed the strategies behind Song military logistics and their influence on fortification designs. Tackett discussed the factors shaping Song defense

strategies, highlighting the military geographical dynamics between the Song and northern nomadic powers, along with the rise in scholarly Song officials and military leaders (Tackett, 2017). Zeng (2006) discovered a significant correlation between land utilization, agriculture, grain storage, and the development of fortifications, noting their collective impact on military campaigns against the Western Xia. Cheng (2006) examined the role of Song logistical strategies in shaping the defensive system and fortification forms along the Song-Western Xia frontier. He (2012) further investigated the operational roles of Sichuan Theater's administrative bodies, the Military Intendancy (制置司) and the Transport Department (转运司),² in the planning and construction of defense line and the logistical coordination. Shi's research into Sichuan's logistics policy revealed that the Jialing River served as the principal conduit for military logistics (Shi, 1999). Chen (1999) scrutinized the multi-trip transport method, termed *Zhuanbanfa* (转般法), a method prevalently employed in Song military endeavors.

The interaction between military strategy and fortification construction also has increasingly become a focal point in European military architecture research. Ellenblum (2007) illustrated how the conflict between the Franks and Muslims, alongside geography and economic pattern, dictated castle distribution within a region, where a predominant central castle, encircled by smaller forts, served logistical and religious functions. Cotterill (1993) investigated the evolving function of late Roman forts in south-eastern Britain, initially conceived in the 3rd century as state trans-shipment hubs for the Roman navy, subsequently transformed into a defense network against Germanic incursions. These forts were integral to a coastal logistics network stretching from the Wash to the Solway Firth, facilitating enhanced state oversight over resource management and frontier provisioning. Furthermore, architectural historians have integrated fortification design, strategic culture, and ordnance technology into a comprehensive military knowledge system. The interplay among these elements has fostered new form pattern and planning principle of fortification, propagated through wartime interactions among military architects, strategists, and engineers. Pollak (2010) examines the emergence and dissemination of polygonal fortifications with bastion systems in pre-modern Europe, analyzing the impact of ideological, military cultural, and technological factors.

3. Initiation of Sichuan Logistical System and construction of Diaoyucheng Fortress

Constructed during the Song-Jin War (1125–1234) and the Song-Mongol War (1235–1279), the Diaoyucheng Fortress served dual functions as a logistical hub in the hinterland and a mountain stronghold on the frontier. The logistical

² In 1145, the name of the transport department within a theater was changed to Zonglingsuo (总领所). Although its main functions remained the same and its scope of authority was expanded, to avoid confusion this study will use "Transport Department" to refer to both names.

and defensive strategies employed within the Sichuan Theater significantly influenced the fortress's site selection, design, construction, and subsequent expansion.

3.1. Initiation of the Sichuan Logistical System and site selection of the Zhuanban Granary during Song-Jin War

Initiated in the early Southern Song period, the Diaoyucheng Fortress's construction was integral to the Sichuan Logistical System. It bolstered the Qinling Defense Line against the Jin Dynasty, notably with the establishment of the Zhuanban Granary (转般仓) at Hezhou.

Between 1125 and 1127, the Jin Dynasty laid siege to Kaifengfu, the Northern Song's capital, twice, annexing substantial portions of Song territory and precipitating the Northern Song Dynasty's downfall. In 1127, Zhao Gou, later Emperor Gaozong during 1127–1162, assumed control over the southern territories and founded the Southern Song Dynasty. In a bid to halt the southward advance of the Jin army, the newly established court, along with local governments and armies, erected a defense line spanning the Qinling Mountains and the Huai River, segmented into three distinct theaters for strategic management (Su, 2008). The Sichuan Theater, encompassing the Qinling Mountains and the Sichuan Basin, was tasked with holding the Qinling Defense Line (He, 2012). It hosted nearly 100,000 troops, requiring an annual supply of 1,500,000 piculs of grain (Shi, 1999). Given the Jin occupation of the Guanzhong Plain, the traditional grain-producing region north of the Qinling Mountains, Zhang Jun, the first Military Intendant of Chuanshan during 1129–1132,³ advocated for a novel logistical approach whereby the Sichuan Basin would furnish the grain needed for the garrisons via transportation (Fig. 3).

Over the next decade, Zhang's successors, Xi Yi, the newly appointed Military Intendant during 1135–1137, and Zhao Kai, the Transport Commissioner during 1135–1137, evolved Zhang's logistical strategies into a comprehensive logistical system through policy formulation, method selection, and the planning of routes and facilities. In 1136, Xi and Zhao determined the route and method for grain transport, adopting the multi-trip transport method, leveraging the river network of the Sichuan Basin. By this period, grain transportation had alternated for several years between the river transport supported by civil servants, and the road transport supported by military officials. In their memorial to Emperor Gaozong, Xi and Zhao outlined the advantages and disadvantages of these two transportation modes. The cost of road transportation was three times higher than that of water transportation, despite the faster speed. This substantial expense had

inflicted damage on the local economy and population, exacerbated by the high mortality rates among the labor force during transport. Furthermore, in the memorial, they proposed Six Suggestions for Grain Transport (漕运六策), aimed at ensuring the availability of logistics through diversified strategies: designating the Jialing and Yangtze Rivers as the primary conduits of the transport network; mandating local administrations within the basin to facilitate grain shipments down the rivers year-round; directing prefectures along the Jialing River to transport grain upstream to Mianzhou's Yuguan in the spring and summer; advising frontier garrisons to procure grain from markets near the Jianmen Pass; recommending that garrisons cultivate food in border areas; and instructing garrisons to amass their supplies from Yuguan (Li, 2013). As a result of these policies, the Sichuan Basin became responsible for nearly 50% of the food supply, amounting to an annual provision of approximately 500,000–700,000 pounds (Ren, 2000; He, 2012) (Table 1). The granaries of various types and sizes, including the Dajun Granary (大军仓) at Yuguan of Mianzhou and the Zhuanban Granary at Hezhou, were strategically positioned along the Jialing River to offer temporary storage for multi-trip transportation (Li, 2013; Yang, 2019) (Fig. 4).

The hydrogeographic characteristics of the Jialing River and the strategic geographic location of Hezhou were pivotal to the site selection as a key transit center within the Sichuan Logistical System. Situated at the confluence of the Jialing, Qu, and Fu rivers, and merely 87 km from the Yangtze River, the Zhuanban Granary could consistently receive grain from the basin throughout the year and dispatch it seasonally, adapting to fluctuating river levels. The cyclical changes in river levels had distinct impacts on agricultural production in Sichuan. The Jialing River's water levels rose during spring and summer, then receded in autumn and winter. In autumn, when grains were harvested, the river's low water levels rendered it impossible for grain ships, weighing 300 piculs and measuring 14 m in length and 3 m in width, to navigate upstream. As a consequence, grains from downstream were temporarily stored in Hezhou granaries, awaiting the spring's higher water levels to facilitate their upstream transportation (Li, 2013) (Fig. 5).

Despite the absence of excavation data from the peninsula precluding exact determination of the granaries' locations, historical documents offer insights that allow us to infer their approximate location, dimensions, and quantity. As detailed in Ren's *Dianjiangzhi*, segment, throughout the wartime period, Hezhou granaries operated for nearly 10 months annually, managing an annual throughput ranging from 600,000 to 700,000 piculs (Li, 1985; Ren, 2000) (Fig. 3). The dimensions of the military granaries in Hezhou are comparable to those in Zhenjiangfu, recognized as one of the most significant military logistical centers in the Jianghuai Theater. Specifically, each Zhuanban Granary at Zhenjiangfu spanned an area of 1540–3245 m² and boasted a capacity exceeding 10,000 m³ per unit (Wang et al., 2011). It is estimated that the number of granaries at Hezhou surpassed 50.

An ideal granary site requires not only flat terrain suitable for large-scale granaries and elevated areas protected from flooding but also access to numerous rivers. This

³ In 1142, a new agency, the Military Intendancy of Sichuan Theater, was established, functionally replacing the Military Intendancy of Chuanshan. This administrative restructuring meant that the Sichuan Basin was entirely incorporated into the Theater. While the Military Commission of Chuanshan and its official positions were retained—mostly held by military officials—the positions within the Military Intendancy of Sichuan were mostly filled by civilian officials. The latter regulated the former.

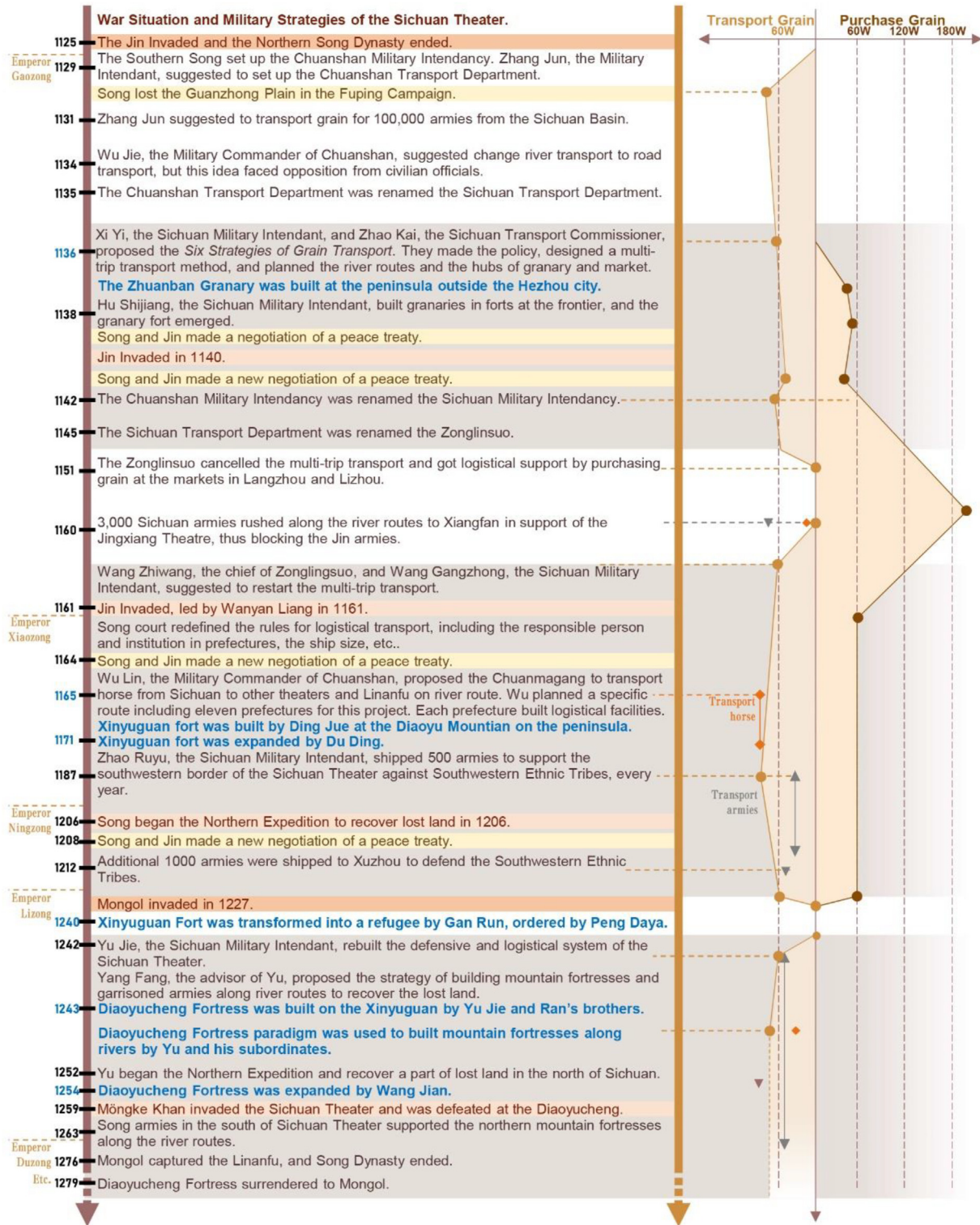


Fig. 3 War preparation, logistical strategy, and fortification construction in the Sichuan Theater, 1125–1279. Source: Huang Wen, 2024.

ensures ample riverbank space to construct ports accommodating ships arriving from various directions. Peninsulas or deltas situated at the confluence of rivers provided optimal terrain, as evidenced by the granaries in Zhenjiang and Guazhou, which shared this strategic geographical

feature. Given these criteria, the eastern peninsula beyond Hezhou city emerged as an ideal choice. Indeed, Yuan Shuoyou, serving as Military Intendant circa 1195, documented the northern port of granaries, the Qujiang Ferry, located at the base of Diaoyu Mountain. During his journey

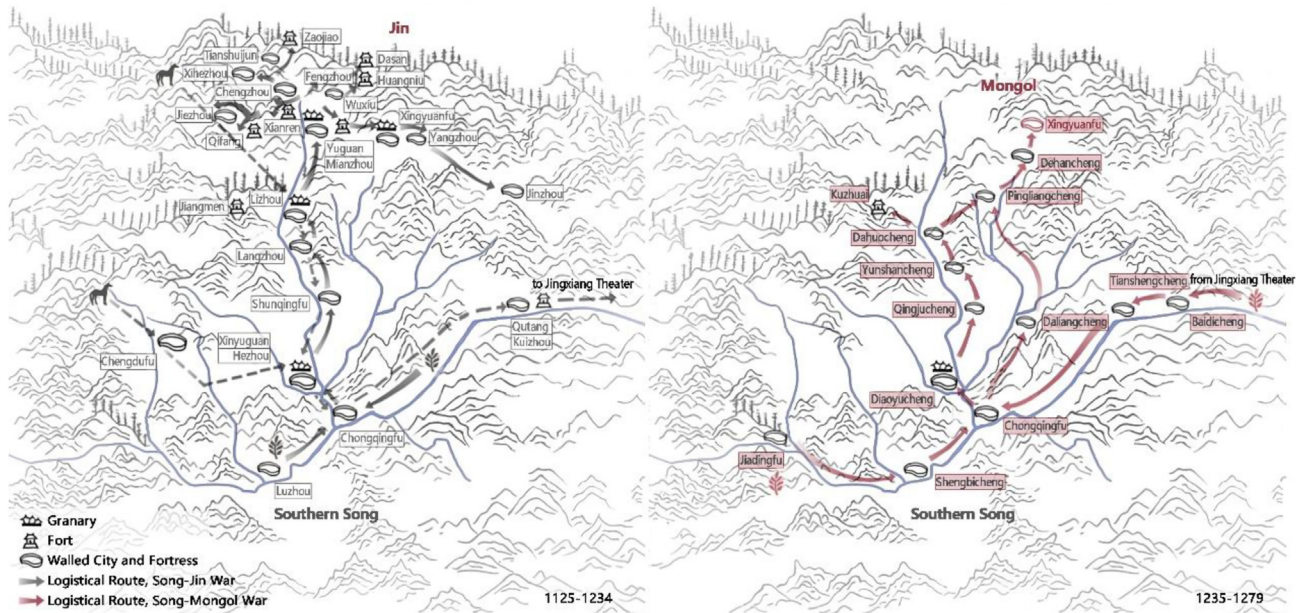


Fig. 4 Logistical system in the Sichuan Theater during Song-Jin War and Song-Mongol War. Source: Huang Wen, 2024.

Table 1 Logistical methods and amounts in the Sichuan theater of the southern song.

Methods	Multi-trip transport	Purchase grain at the borders	Cultivation at the borders	Moving troops approach grain	Others
Sources	Jiazhou, Luzhou, Kuizhou	Lizhou and Langzhou at hinterland; Xingyuanfu, Liangzhou and Yangzhou at the borders	Xingyuanfu, Liangzhou, Yangzhou, Chengzhou, etc.	Mianzhou and Langzhou at hinterland; Liangzhou and Yangzhou at the borders	—
Amounts	500–700	500 in Gaozong period	100–220	limited	limited
1000 piculs	Max 790	600 in Xiaozong period			
Proportion	30%–46%	Max 1980	6.7–13.3%	—	—
		30%–40%			

down the Jialing River to Hezhou, Yuan (1998) observed the bustling activity at the ferry, which inspired him to compose a poem about this scene.

3.2. Development of the Sichuan Logistical System and planning of the Xinyuguan Fort

After functioning smoothly for two decades, the Zhuanban Granary faced a new challenge when Wanyan Liang, Emperor of Jin during 1149–1161, launched a sudden invasion of Song territory in 1161. This aggression precipitated an immediate counteroffensive by Emperor Gaozong, and subsequently, extensive war preparations by Emperor Xiaozong during 1162–1189. This series of military upheavals directly catalyzed the enhancement of the Sichuan logistics system and prompted the construction of the Xinyuguan Fort adjacent to the Hezhou granaries.

During the abrupt conflict of 1161, the Southern Song efficiently mobilized troops and supplies across three theaters, relying on the logistical networks along the Jialing

and Yangtze rivers to intercept Jin forces, swiftly de-escalating the conflict. However, the concerns over Jin breaking treaty again and subsequent invasion, coupled with Emperor Xiaozong's ambition to reclaim lost territories (He, 2012), prompted the Song Dynasty to initiate a series of strategic adjustments across all three theaters. Enhancing the defense system's depth and the logistical network's efficiency, particularly by integrating forts with transport hubs, became the primary focus of these adjustments. As Zhang (2006) explained to Emperor Xiaozong with a memorial in 1162, discussing the strategic role of the Guazhou granary fort in the Jianghua Theater, these new fortifications were designed for defending, offending, and offering alternative protections for military forces during wartime.

Under Emperor Xiaozong's strategic directives, the Sichuan logistical network was significantly enhanced to include the transportation of armies and horses via riverine routes from Sichuan to other theaters and Linanfu, the Southern Song's capital. This initiative, named "Chuanmangang (川马纲)", was proposed in 1165 by Wu Lin, the Military

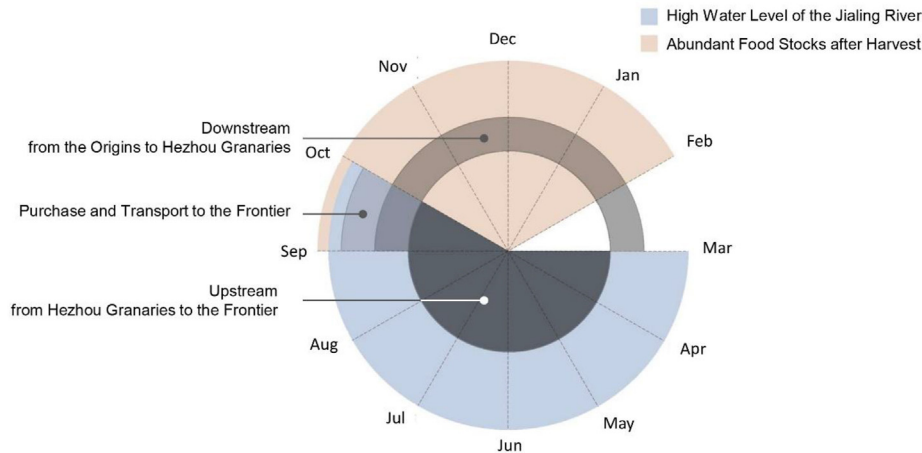


Fig. 5 Mechanism of the logistical strategy in the Sichuan Theater, conceived by Xi Yi and Zhao Kai. Source: Huang Wen, 2024.

Commander of Chuanshan during 1161–1167. The Chuanmagang aimed to supplant overland horse transportation, thereby reducing mortality rates among horses. Consequently, the pre-existing river routes, primarily used for regional grain transportation, were integrated into the Song logistical network, extending to the east and reaching the Yangtze River. To safeguard the growing type and quantity of military resources, forts were constructed at strategic locations along these routes. Wu selected eleven prefectures along the Jialing and Yangtze Rivers to participate in this project, which facilitated the shipment of nearly 10,000 horses annually. This accounted for 90% of the total horse shipments, utilizing a multi-trip transport method. Additionally, the project also served the Sichuan armies directly, with the capital recruiting 500–1000 soldiers from Sichuan annually (Li, 1985; Xu, 1957) (Figs. 3 and 4).

Hezhou also served as a key hub of the Chuanmagang system. cooperated with the Military Commission of Chuanshan and the Transport Department of Kuizhoulu, Hezhou's governors—Ding Jue (circa 1164), Han Bing (circa 1169), and Du Ding (circa 1171)—formed a team, comprising over 45 horse ships, 350 troops, and 1200 sailors. The essential facilities such as horse staging areas, barracks, shipyards, and administrative offices were also established on the peninsula (Li, 1985).

Building an administrative facility in the Xinyuguan Fort atop the Diaoyu Mountain, to overseeing the military resources from a high ground, was the linchpin of this strategy. Acquiring land for the new fort from the Huguo Temple was an ingenious plan, securing legal land for military infrastructure. This approach satisfied security needs while effectively managing costs. Approximately fifteen years prior, to generate adequate tax revenue for the Qinling Defense Line (Liu, 2015), Wang Zhiwang, an official of the Transport Department of Tongchuanfulu, initiated the Land Survey Measure (经界法) in Sichuan. This policy resulted in a comprehensive cadaster covering both suburban and rural regions (Wang, 2006). Subsequently, it became mandatory to secure land ownership before initiating any construction projects. On the other hand, leveraging a religious management system that involved granting titles, the local government could engage in religious affairs, particularly in

construction, by applying the titles for temples from the Song court (Hansen, 2014). This exchange of benefits granted the government the right to use the lands and spaces of temples. As detailed in the *Record of Scenic Spots Across the Country* (《輿地纪胜》), the Hezhou government administered numerous hilltop temples outside the city (Wang, 1992). Additionally, the local government repurposed abandoned private villas into temples dedicated to sages. An example includes the transformation of Zhang Zongfang's Yangxinting into Yangxintang for Zhou Dunyi (1017–1073) on Xueshi Mountain at the peninsula, completed in 1218 (Wei, 2006). Following its expansion and renaming at the early Southern Song, the Huguo Temple on Diaoyu Mountain emerged as the largest mountain temple at Hezhou, coming under the control of local government (Zhang, 1992) (Figs. 6 and 7).

During the Xiaozong period (1162–1198), the Xinyuguan Fort was constructed twice, with land requisitioned from the Huguo Temple each time. This resulted in a configuration that spanned the western terrace and the northern area of the central terrace, coexisting with the temple (Fig. 8). In the first phase of construction around 1165, the local government built the administrative buildings on the western terrace, which was the cemetery and farmland of temple, choosing not to use the temple to the south of the central terrace. According to the archaeological excavation, the relationship between office buildings and family cemeteries showed the natural soil slope was transformed into two groups of architectures with huge platforms and water system, including the office building and its garden (CMRICRA and ADBSM, 2021). The office complex consisted of at least five courtyards arranged around a central axis, surrounded by a front gate, halls, ponds and multi-storey buildings, and conformed to the prescribed norms of office buildings for a fourth-level administrative unit. There was a large pond at the center of the garden, encircled by various pavilions. Consequently, this construction entailed a significant transformation of the terrain, made feasible by the availability of ample time and labor resources.

In the second construction phase circa 1171, Du Ding expanded the fort to enclose a part of the central terrace,

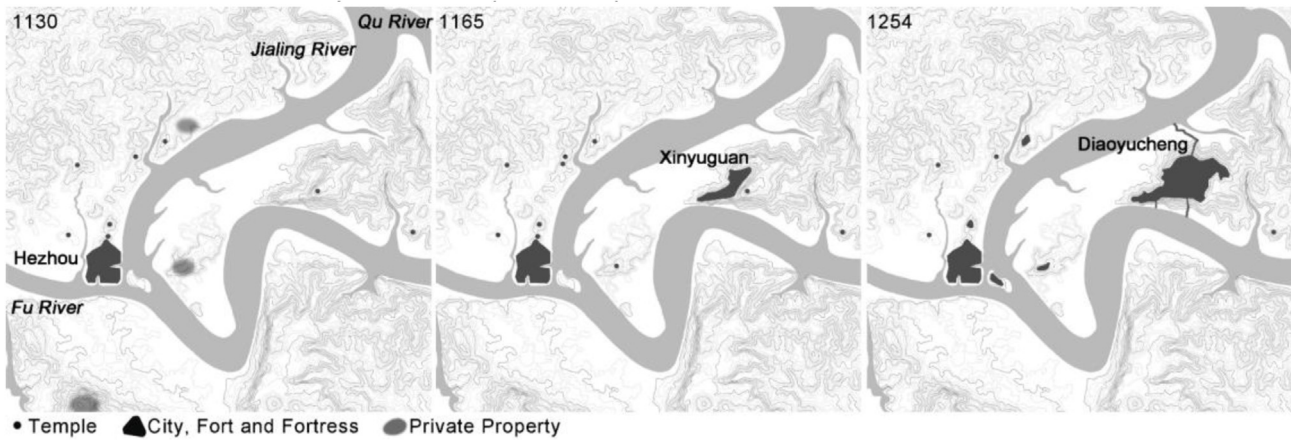


Fig. 6 Requisitioning the mountain temples to build mountain forts and forming the forts cluster. Source: Huang Wen, 2024.

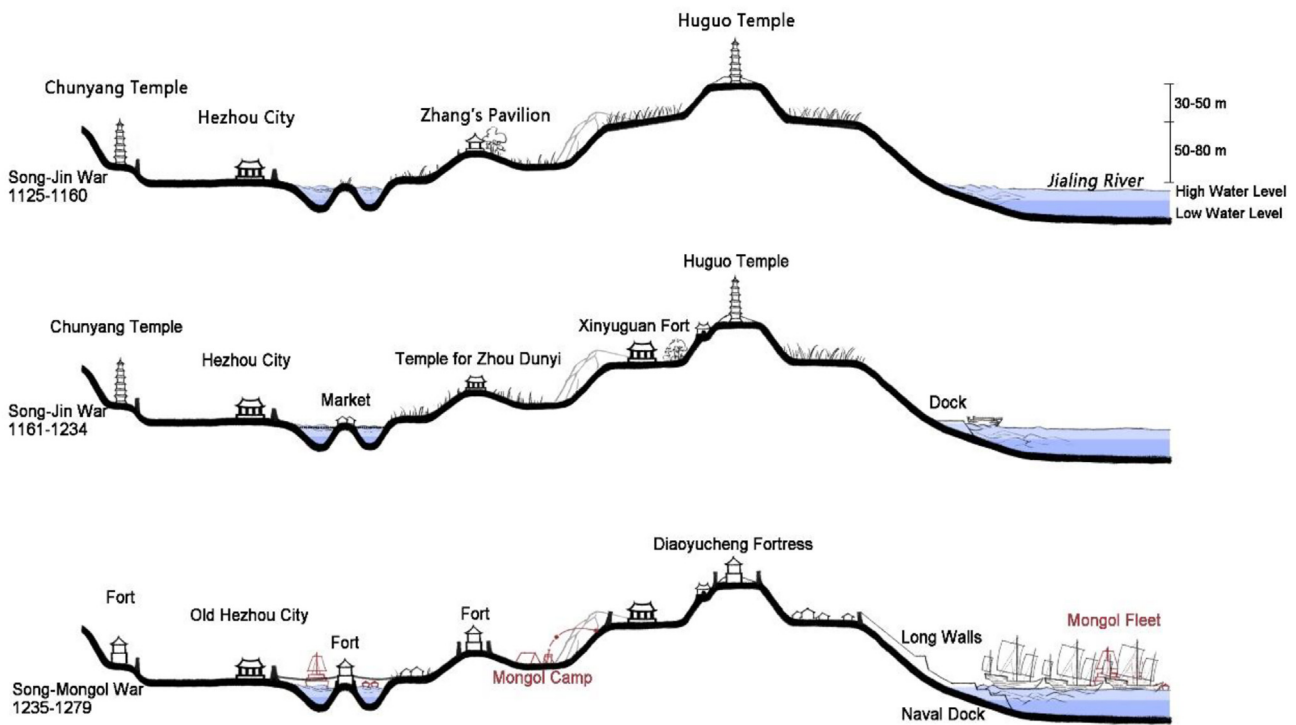


Fig. 7 Spatial transformation of the Diaoyucheng Fortress, sectional view. Source: Huang Wen, 2024.

creating a dedicated space for social activities among local officials.⁴ A pond was placed at the center of the central terrace, effectively dividing the area into two distinct sections. This pond, shallow enough to swim across, was spanned by a stone bridge designed with a beam supported by columns, contrasting with the more defensively oriented drawbridge typically used across moats. These architectural features indicate that the pond was intended as an

⁴ In the Song Dynasty, the local officials were forbidden to build new office buildings within the city. However, they circumvented this restriction by establishing new spaces for socialising and resting in the mountainous areas surrounding the city.

artificial landscape rather than a defensive structure (Figs. 8 and 9). To the south of the pond lay the Huguo Temple, while the elevated northern area, offering panoramic views of the mountain and river confluences, was selected by Du to build a new set of office buildings. Pending further archaeological investigation, the Feixilou, a multi-story structure, has been acknowledged as one of the notable new constructions in this area. As documented in the *Record of the Feixilou* (《飞鳶楼赋》) by Li Kai, a colleague of Du, officials from Tongchuanfulu extended their congratulations to Du upon the project's completion (Li, 2006). This venue hosted both private and official gatherings of local

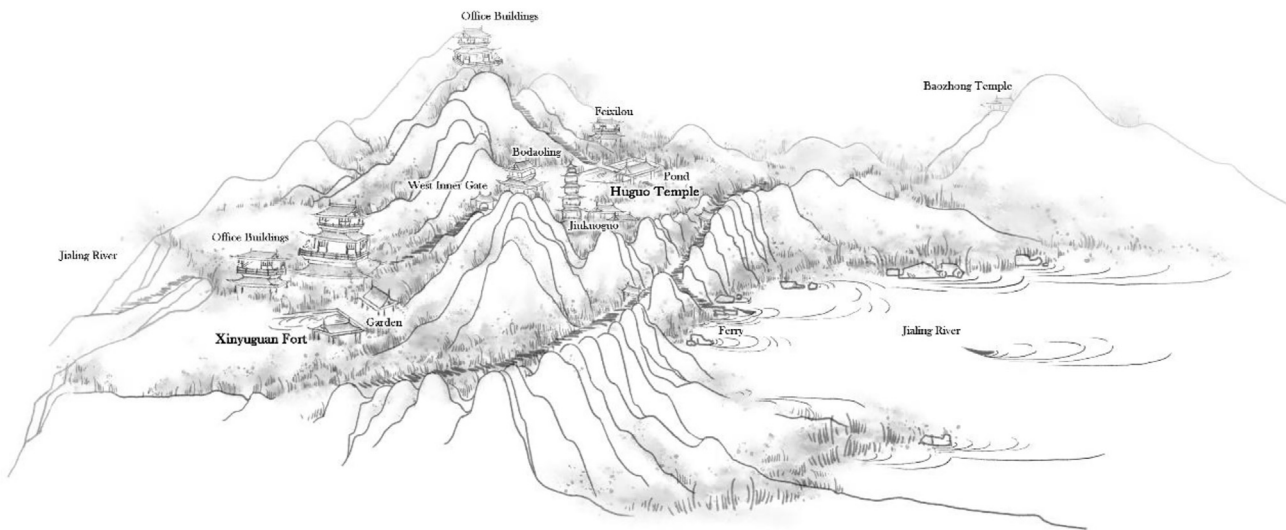


Fig. 8 Natural and cultural landscape on the Diaoyu Mountain during the Song-Jin War. Source: Huang Wen, 2024.

officials, as such spaces were popular during the Southern Song Dynasty (Fig. 10).

Contrary to expectations, no defensive walls were constructed within the fort during this period. Instead, walls were employed to delineate the boundaries between the fort and the temple, exemplified by the westinner wall and its gate at the Jiukouguo, the central terrace's edge. This wall was a single-faced retaining stone wall, reinforcing the earth slope into a steep cliff, and the gate was a wooden gate fastened to a bedrock. The wall and gate were positioned to hold the pathway between the temple and the fort, controlling the movement up and down the slope (Figs. 8, 10 and 11). A map etched on a stone component of the administrative building in the Xinyuguan Fort illustrates the spatial relationship between the gate, the pagoda of Huguo Temple, and the office building on the central terrace (Fig. 10).

The design for Xinyuguan Fort during the Xiaozong period aimed to integrate military function while preserving the dual identity of the Diaoyu Mountain, as both a scenic destination and a sacred site. Since the need for advanced defensive capabilities was less pressing, the local government made efforts to minimize the impact of military installations on local society. Consequently, the subdivision of land with ponds and walls emerged as an effective strategy to optimize the use of limited space. Inscription on the Diaoyu Mountain's cliffs documented that the western terrace was used for logistical operations, whereas the Huguo Temple continued to serve as a venue for regular religious ceremonies and public events (Zhang, 1992).

The emergence of the Xinyuguan Fort marked the transformation of a traditional granaries into a fortified granary complex. During the Southern Song Dynasty, this distinctive form of fortification was established at strategic points along major transportation routes to optimize the allocation of resources for border defense. The fortification was comprised of two main components: a logistical granary area situated on flat terrain, and a defensive structure positioned on elevated terrain. The facilities of the former



Fig. 9 Pond and wall subdividing the central terrace into two areas. Source: Zhang Yufei, 2023; drawn by Huang Wen.

were organized according to the specific type of the logistics supplies, such as granaries, stables, and fodder warehouses. Furthermore, this part was often equipped with docks and shipyards. The latter focused on the administrative buildings.

Serving as a Guan, the fourth-level administrative unit of Song, the Xinyuguan Fort symbolized a significant shift in Hezhou's spatial organization. It functioned as both a satellite city and a military subcenter of Hezhou, thereby leading to the separation of military function from administrative function at Hezhou. A twin-city structure, comprising a fort on a hilltop and a city on the adjacent flatland, therefore formed. Fan Chengda, serving as Military Intendant from 1175 to 1178, composed a poem capturing the synergy between the two cities straddling the Jialing River during his 1175 boat journey to Hezhou (Fan, 1998) (Figs. 6 and 7).

The concept of multi-city is widespread, evident in various forms such as Zicheng-Luocheng system (Guo, 1985), citadels (Pollak, 2010), acropolises (Thomas and Conant, 2009), and Gusuku (Ladefoged and Pearson, 2000)



Fig. 10 Stone inscription of the administrative office building in the Xinyuguan Fort. Left: Map of the west and central terraces; right: Socialization of Song officials. Source: Huang Wen, 2024.

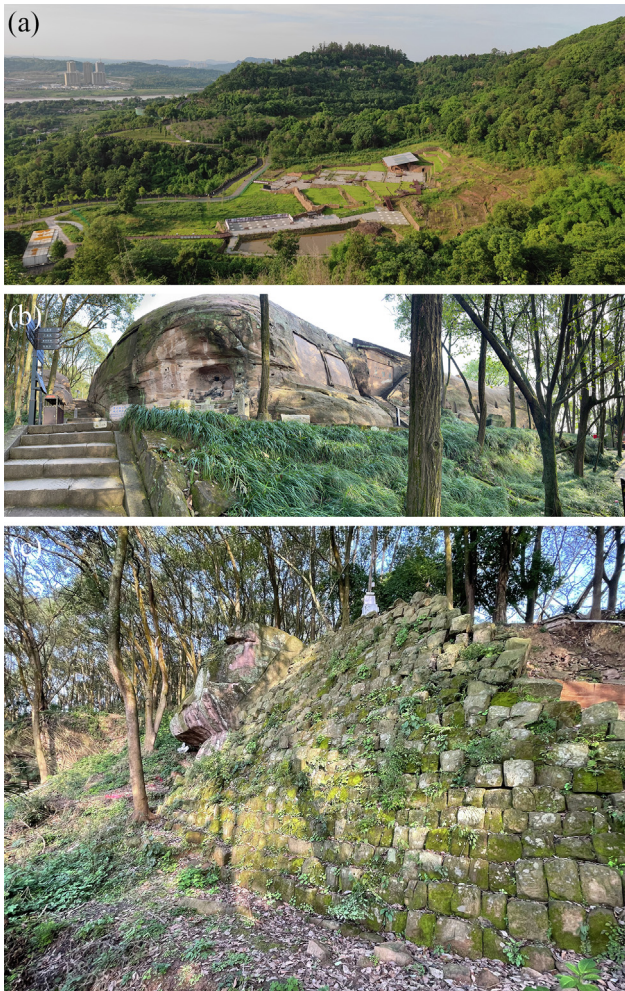


Fig. 11 Remains of the Xinyuguan Fort built during the Song–Jin War (a) The stone stylobates of the administrative office buildings; (b) the west inner gate standing on the road, separating the west and central terraces; (c) the west inner wall between the west and central terraces. Source: (a) Zhang Yufei, 2023; (b), (c) Huang Wen, 2022.

across Eurasia. Unlike other twin cities that naturally evolved into compact entities, the Hezhou twin-city model exhibited a more dispersed arrangement. The local government relinquished the areas adjacent to the old city, like the riverbanks and the Chunyang Mountain, opting instead for the Diaoyu Mountain on the peninsula to oversee the river traffic. This decision was the consequence of the general defense strategy of Song, instead of the option of local government. On the other hand, during wartime, a hinterland prefecture established a fort of lower administrative level, signifying a resurgence of local power that had previously been curtailed by the Song court. Absent the Mongol incursions and the relocation of Hezhou government to the Xinyuguan Fort, this twin-city could be viewed as a precursor to the multi-city structure of the Ming and Qing Dynasties (Chang, 1977).

3.3. Rebuilding of the Sichuan defense line and construction of the Diaoyucheng Fortress

At the beginning of the 13th century, the Mongol conquest throughout Eurasia profoundly impacted the military-geographical circumstance of the Sichuan Theater. Under Mongol's intense and repeated attack since 1227, the Qinling Defense Line and the Jianmen Pass collapsed in 1236, leaving the hinterland of the Sichuan Basin exposed to the Mongols. Lacking adequate garrisons and fortifications, over 60% of the cities succumbed to siege and destructed. The defensive strategy of Sichuan, therefore, shifted from land defense to river defense. Courtiers and generals proposed to Emperor Lizong during 1224–1264 that the river defense strategy should be extended into Sichuan, advocating the construction of barriers along the Yangtze River, to prevent the Mongols from occupying its upstream (Huang, 2016; Li, 1966).

The quality of the fortifications and their interconnection within the defensive system were crucial to the defense of the river at this point. The principal advantages of the Southern Song against the Mongol cavalry lay in the topography and naval power (Li, 2023). Consequently, the integration of the pre-existing river-based logistic network

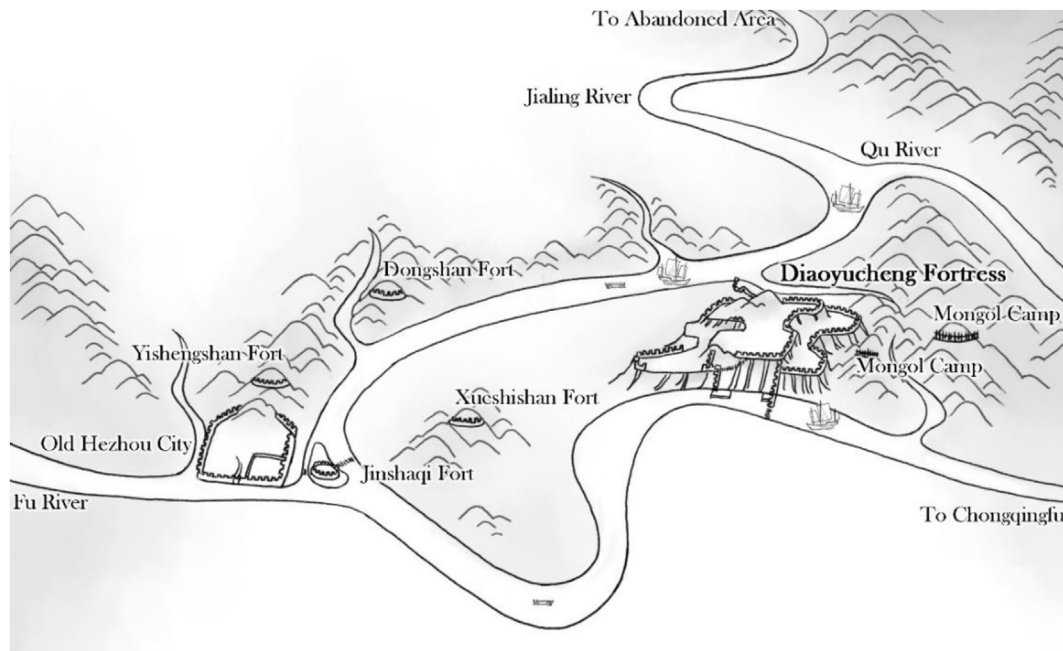


Fig. 12 River defense in the form of mountain fort cluster during the Song-Mongol War. Source: Huang Wen, 2024.

into the defensive system emerged as a viable solution to fulfill these strategic needs. In 1242, Emperor Lizong appointed Yu Jie as the new Military Intendant of the Sichuan Theater, recognizing his considerable naval leadership experience in the Jianghuai Theater and his previous role as Deputy Military Intendant of Huaidong (Li, 1966). Yu undertook the reevaluation and reconstruction of a new defense line, adapting to realistic conditions and demands by enlarging existing logistical forts and erecting new fortresses along rivers in the Sichuan Basin. He abandoned the flatlands, and relocated local governments to mountain fortresses. Since 1243, a new type of defence was gradually established, consisting of mountain fortresses on the river banks.

At this stage, due to the destruction of northern cities, Hezhou served not only as the water gateway to Sichuan and the northern barrier of the command center in Chongqingfu, but also played a crucial role in provisioning the construction of northern fortresses. The Xinyuguan Fort was selected for the construction of the mountain fortress. Indeed, as early as 1240, this fort had provided refuge for both local armies and civilians. Following the directives of Peng Daya, the Deputy Military Intendant of the Sichuan Theater circa 1242, Gan Run, the sheriff of Hezhou, erected

stone walls on the southeastern slope of the Diaoyu Mountain to enclose the temple on the central terrace into the fort (Figs. 12, 13 and 14) (Liu and Tian, 1979; CMRICRA and ADBSM, 2021). In 1243, Yu appointed Ran Jin and Ran Pu as governors of Hezhou, entrusting them with the official task of constructing the Diaoyucheng Fortress. They built walls to enclose the central terrace, and built long walls⁵ along both the southern and northern slopes of the Diaoyu Mountain to fortify the peninsula. They also added two new docks connecting to the long walls. The Hezhou government and the forces of Xingrongsi (兴戎司), one of the four Border Garrisons of the Qinling Defense Line, relocated to the mountain fortress, by using and expanding the halls of Huguo Temple and the office buildings of Xinyuguan Fort. At the western terrace, two warehouses, an official temple, and a pharmaceutical workshop were built. The temple hall at Jiukouguo, overlooking the Jialing River, was transformed into a multi-story military command center (CMRICRA and ADBSM, 2021). Circa 1254, Wang Jian, the general and governor of the fortress, undertook its expansion to encompass the eastern terrace (Figs. 12 and 13).

Unlike the walls built during the Song-Jin War, the primary function of walls in this period shifted towards defense rather than separation. Their design and construction methods were tailored to suit the particular landscape and the enemy's attack tactics. Apart from the single-faced retaining wall along the steep cliff of the terrace, the defensive circuit included two additional types of walls. One type was the two-faced wall, featuring shorter on one side and taller on another side, constructed along the terrace's gentle slopes to bolster the natural boundaries (Fig. 15-a). The other was a two-faced wall of equal height on both sides, serving as the long wall on slopes running perpendicular to the contour lines (Fig. 15-b and 15-c). The western border of the west terrace, characterized by steep stone cliffs and shielded by long walls, remained unaltered.

⁵ The term "Long Wall", referred to as "Yizicheng (一字城)" in Yuan Dynasty documents, is also identified as "Yicheng (翼城)" in Southern Song Dynasty documents. For further reading, see Sun, H., 2011. Yang Ma Cheng City and Yi Zi Cheng City). *Archaeology and Cultural Relics* (01), 73–85 + 123 (in Chinese); and Huang, B., 2020. Guazhou City Construction During Southern Song Dynasty. *China Local Records* (05), 67–77 + 126 (in Chinese). This structure of identical function and form is also known as the "long walls" in the ancient city of Athens. This study adopts this terminology for functional analysis and comparison. Refer to Conwell, D. 2008. *Connecting a city to the sea: the history of the Athenian long walls*. Brill, Leiden.

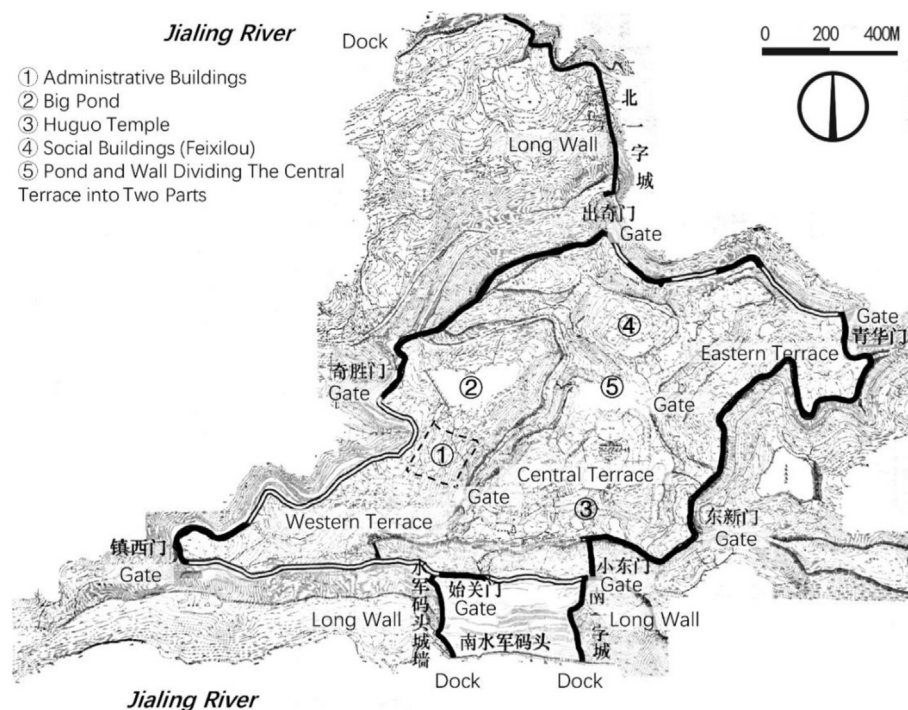


Fig. 13 Layout and key remains of the Diaoyucheng Fortress. Source: CMRICRA and ADBSM, 2021, redrawn by Huang Wen.

While now vanished, these walls were originally equipped with battlements. Given the natural elevation of the red stone mesa, approximately 30–50 m above the adjacent flatlands, constructing tall walls was deemed unnecessary. This approach contrasts with the practices observed in Muslim mountain castles or the Gusuku of the Kingdom of Ryukyu, where tall walls were common (Ladefoged and Pearson, 2000; Willey, 2005). The earlier soft perimeter of Xinyuguan Fort, including ponds and wooden gates, were forsaken. To strengthen the defences, Ran's brothers built new walls next to the pond on the central terrace, linking it to the circuit (Fig. 9), and converted the path from the hilltop to the dock into the south-western long wall. Furthermore, the topography of the mesa limited access to the fortress, which determined the placement and number of gates and Mamians (ancient Chinese bastions) along the walls. Gates were strategically placed at ravines and ridges, while Mamians, designed as producing platforms in this context, were positioned on the ridges. The gates of this fortress were designed with a certain depth, featuring uphill roads, flanked by platforms within the gate. When besiegers attempted to attack the entrance, they were forced to climb along the narrow roads. This predictable movement allowed defenders stationed on the Mamians to easily repel the attackers. After the enemies survived the firepower and entered the gate, they were attacked by the defenders stationed on the platforms (Fig. 14).

After these expansions, the layout of the Diaoyucheng Fortress can be described as a hilltop fortified by the circuit, with the peninsula safeguarded by three long walls. The heart of the mountain fortress comprised four distinct areas, situated across three parallel terraces, each at a varying elevation (CMRICRA and ADBSM, 2021). Natural cliffs, alongside artificial walls and ponds, nearly enclosed

each area, forming its boundaries. In three out of these four areas, at least one building with an extensive multi-platform foundation served as the core, around which barracks and other military facilities were distributed throughout the adjacent open areas.

There was a coherent strategy linking the design of the Diaoyucheng fortress with the wider Sichuan defence system. The long walls were the crucial elements for this strategy, transforming the mountain fortress into a naval base featuring extensive flat lands and elongated berths on the peninsula. This fortress form was colloquially referred to as a "dustpan" in the local gazetteers (Huang, 2020). The Diaoyucheng Fortress and ancient Athens shared a similar planning (Conwell, 2008), as both two entities, far from the water, gained their naval force by building long walls extending into river or sea. Such elements guaranteed the continued evolution of the river defense system and influenced the site selection and spatial arrangement of other mountain fortresses. Between 1242 and 1252, Diaoyucheng Fortress maintained its logistical importance by supporting the construction of new fortresses along the Jialing and Qu rivers through its naval fleet. Annually, numerous vessels departed from Hezhou, transporting generals, military forces, and resources to the northern territories, previously devastated and abandoned. Leveraging this, Yu regained the lost territories along the Jialing and Qu Rivers, and embarked on a northern expedition in 1251 (Tuo, 1985). In this respect, akin to the central castle in an area built by Frankish (Ellenblum, 2007), the Diaoyucheng Fortress provided economic and military support to the adjacent mountain fortresses. Moreover, the design of the long walls in Diaoyucheng Fortress laid the groundwork for developing a river defense strategy characterized by a cluster of mountain forts (Fig. 4).

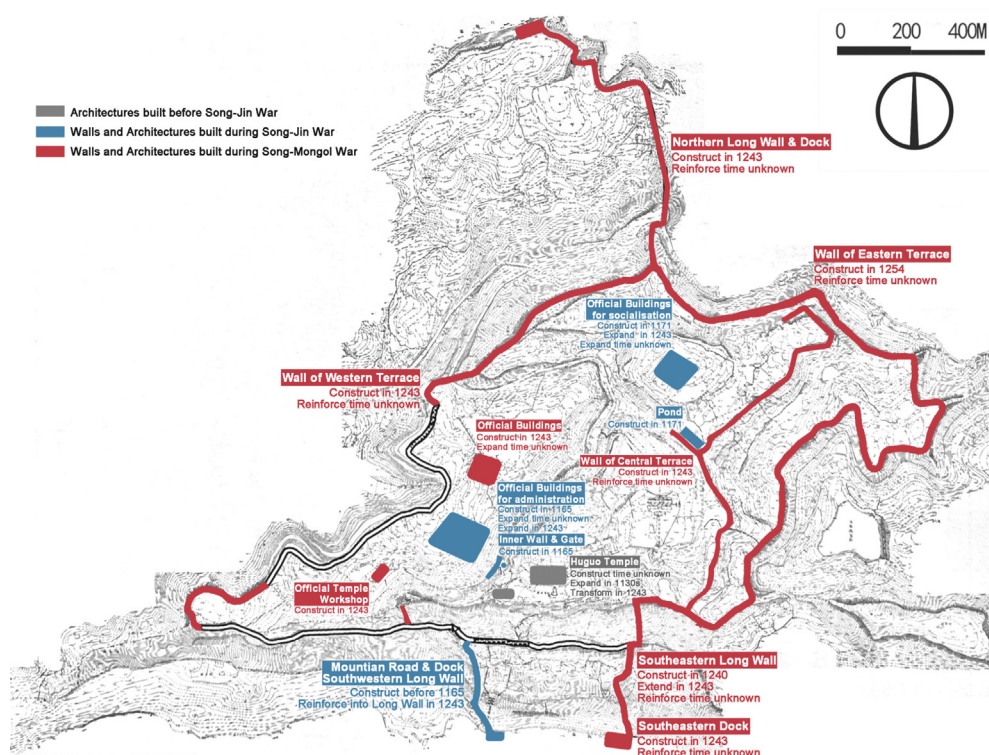


Fig. 14 Construction and transformation of the Diaoyucheng Fortress during Song-Jin and Song-Mongol Wars. Source: [CMRICRA](#) and [ADBSM, 2021](#); redrawn by Huang Wen.

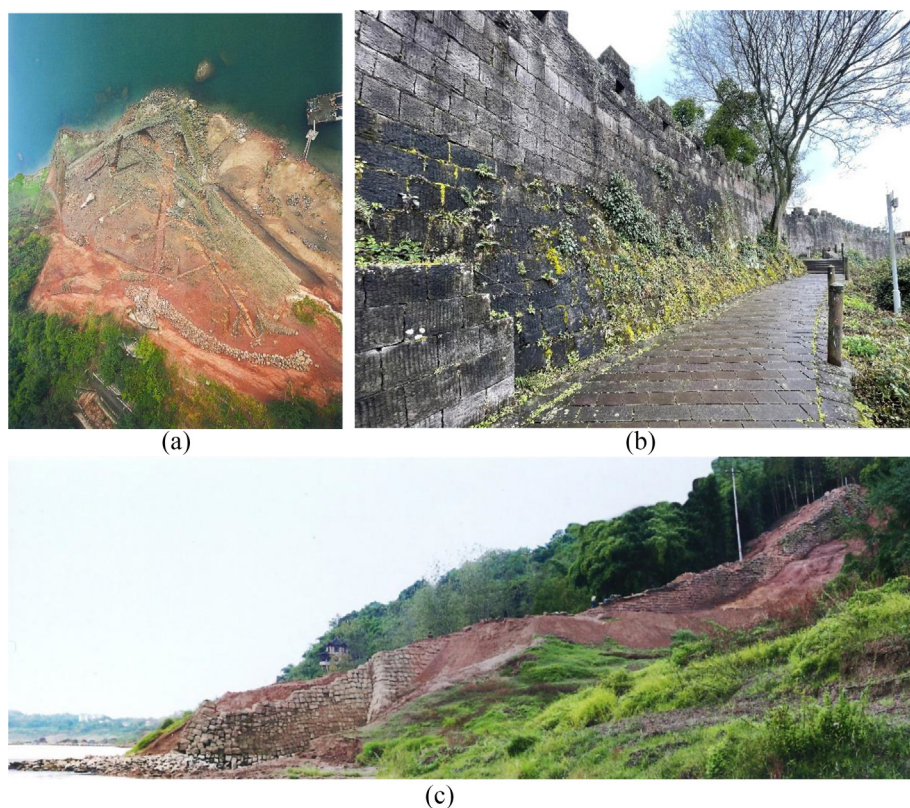


Fig. 15 The remains built during the Song-Mongol War. (a) The southwest long wall and the naval port, 2008; (b) the circuit near the Qisheng Gate, rebuilt around 1800s and 2000s, 2022; (c) the southeast long wall, 2008. Source: (a), (c) [CMRICRA](#) and [ADBSM, 2021](#); (b) Huang Wen, 2024.

3.4. Expansion into a mountain fort cluster of river defense

Since 1251, when the Mongols changed their strategy from regular annual plunder to occupying Song territory by building fortifications, and in 1261 when the Mongol navy achieved significant development, they began to harass the Sichuan Theater more frequently with cavalry and navy. This situation forced the Song armies to strengthen their river defenses. On the other hand, under Yu's decade-long leadership, Sichuan experienced a partial recovery, and the growing garrison population was to be moved from the fortresses to nearby new forts. As a result, the twin-city structure of the Diaoyucheng Fortress evolved into a fort cluster at the confluence of three rivers, achieved by transforming adjacent mountain temples into secondary mountain forts. The lands for these new constructions also came from the mountain temples overseen by the local government, including the Buddhist temple on East Mountain, the Taoist temple on Chunyang Mountain, and Zhou Dunyi's temple on Xueshi Mountain on the peninsula (Liu and Tian, 1979; ECHCSP, 1995) (Figs. 6, 7 and 12). These temples served as physical foundations for the new constructions, allowing garrisons to directly use the existing buildings and infrastructure. Temple halls were repurposed into office buildings, while multistory buildings assumed the role of watchtowers. The temple walls were transformed into fortifications. Depending on their size and location, these forts were assigned varied military roles: the central Diaoyucheng Fortress for garrison and command, the old city for civilian habitation, and the secondary forts for surveillance.

Inter-fort cooperation was facilitated by external facilities, including the long walls and naval docks of the fortress, pontoons, and the fleet on the rivers. The Song armies were able to move quickly from the mountains to the warships as soon as they sighted the approaching Mongols, with forts on either side supporting the Song naval units in battle. These mountain fortresses, therefore, were able to control river at key points (Fig. 12). In 1255, Zhang Jue, the general and governor of the Diaoyucheng Fortress during 1259–1274, successfully defeated the Mongol navy by trapping them in a narrow section of the river with warships and these facilities (Tuo, 1985). The pattern of mountain forts cluster represented a tactical approach to securing strategic locations, which was also employed in other mountain fortresses developed by Yu and his successors, including the Shenbicheng Fortress and the Baidicheng Fortress.

Throughout the nomadic conquest during the 11th to 13th centuries, Eurasian ethnic groups leveraged natural landscapes, such as rivers and mountains, to mitigate the superiority of nomadic cavalry and new military technologies, notably the counterweight trebuchet. In contrast to contemporaneous fortifications, the Southern Song improve both their defensive and offensive strategies on land and in the rivers, by taking the advantage of topography and naval power. Muslims (Raphael, 2010), Crusaders (Ellenblum, 2007), Goguryeo (Le, 2019), and Hungarians (Pow, 2019) similarly established fortifications on hills or islands near significant waterways such as the Euphrates River and the

Danube. As the forces were mainly infantry, their castles were typically located on isolated hilltops, away from riverbanks. Consequently, these rivers functioned as natural barriers without additional integration into the fortifications. The site on peninsular, the long wall connecting mountain circuit and naval port, and the surrounding secondary mountain forts enabled the Song navy in the Diaoyucheng Fortress to proactively engage riverine adversaries, instead of remaining passive within the circuit. Furthermore, the expansive and flat mesa summit granted Diaoyucheng Fortress a larger footprint compared to contemporaneous castles, facilitating ample water supply and storage capacity for a significant garrison and civilian population. This site selection pattern, characterized by Yang Fang, Yu's chief advisor, as aggregating smaller forts into a large fortress, provided the Diaoyucheng Fortress the capability to compete with besiegers on the supplies during a four-month siege in 1259 (2006). This fortress was able to withstand sieges until the enemies exhausted resources and withdrew, rather than hoping the reinforcement to relieve the siege.

3.5. Form pattern and defensive strategy

The planning and construction process of the Diaoyucheng Fortress reveals the distinctive spatial features, such as the site on a confluence peninsula, the "dustpan" pattern, a multi-area layout, and the fort cluster. These features of river defense strategy contributed to the transformation of the Diaoyucheng Fortress from a logistical hub into a frontier stronghold.

The comparisons with other river defense fortifications recorded in the historical documents and maps in the Song Dynasty show that the riverside mesa landscape, the naval force, and the tactical preference for fighting in the fields are the key factors shaping the spatial features of the Diaoyucheng Fortress. The Yudingcheng Fortress, guarding one of the five tributaries of the Yangtze River, the Tuo River, was a component of Yu's Sichuan Defense System, but its design diverged from that of the Diaoyucheng Fortress. Although the Yundingcheng Fortress, surrounded by its forts, formed a cluster overseeing the Tuo River, the steep 500-m descent from the hilltop to the riverbank prevented the construction of a long wall for direct river control. Indeed, the Yundingcheng Fortress communicated with the defense system through its twin city, the Huainajun city, situated on the flat riverbank. This loose connection to the river, reminiscent of Muslim fortifications, indicated that the strategic intent of the Yundingcheng Fortress was more to deter and alert enemies than to halt their advances along the river. The topography, therefore, emerged as a critical factor, with the Longquan Mountains presenting a more formidable elevation and steepness compared to the mesa at Hezhou. Besides, the garrison in this fortress was the Lirongsi (利戎司), one of the four Border Garrisons at Qinling Defense Line, just like the Xingrongsi. Without the integration with naval forces at the hinterland, this infantry adhered to its mountain warfare tactics, frequently defying Yu's commands. The ensuing conflict between Yu and Yao Shian, the general of Lirongsi circa 1252, precipitated Yu's dismissal and

subsequent death. Third, located on the edge of the Chengdu Plain—a region that suffered the worst damage at the beginning of the Song-Mongol War—the Yundingcheng Fortress and its garrison faced challenges of getting support from the local society, thereby adopting a self-defensive stance in its planning (Huang and Feng, 2023) (Fig. 16).

The design principles of river defense fortifications, influenced by naval warfare that based on city defenses and plain topographies, were prevalent across various theaters of the Southern Song. Li Zengbo, a military strategist of renown comparable to Yu's in the late Southern Song, orchestrated the development of at least five strongholds against the Mongols. These included Sizhou, Taizhou, and Shouzhou in the Jianghuai Theater; Jingjiangfu in the Guangxi Theater; and the notable twin cities of Xiangyang and Fancheng in the Jingxiang Theater. Li advocated for constructing fortifications on both riverbanks to obstruct river, in collaboration with naval forces. In contrast to Yu's military idea of taking topographical advantage at the Diaoyucheng Fortress, Li implemented a defensive system comprising moats and Zicheng (small forts situated outside the main fortress gates) across these five fortified cities (Liu et al., 2018) (Fig. 16). It should be emphasized, however, that the cities fortified in this way were vulnerable to counterweight trebuchets, a threat to which the Sichuan mountain fortresses were notably impervious. In 1267, Kublai Khan shifted his strategy to a direct assault on Xiangyang and Fancheng in the Jingxiang Theater, bypassing the Sichuan Theater. The fall of this twin-city to the siege with trebuchet precipitated the loss of control over the Yangtze River and signaled the end of the Song Dynasty. Furthermore, the contrasting tactics of Yu and Li

significantly influenced the underlying design principles of fortifications. Yu, mentored by Zhao Kui (1186–1266) from a distinguished family of generals active in the Jianghuai Theater, championed field combat supported by fortifications, envisioning them to extend centrifugally into the battlegrounds, akin to the long walls. Li, a civilian strategist, favored city defenses, leveraging the landscape and fortifications to forge concentrated defensive positions. In response to a tri-directional Mongol invasion in 1259, Li was tasked with enlarging Jingjiangfu city to halt the western advance spearheaded by Uriyangkhadai (Zhou, 2012). Due to Li's city-centric defensive tactics, however, Song armies failed to stop the Mongols from bypassing the Guangxi Theater to reach Tangzhou, resulting in his dismissal by Emperor Lizong.

In summary, the spatial characteristics of fortifications during the Southern Song Dynasty were shaped by an interplay of local geography and military ideas. Generals and officials, employing diverse tactics commanding different types of troops, used both natural and cultural landscapes to construct fortifications tailored to wartime needs.

4. Discussion: the Diaoyucheng Fortress paradigm and knowledge system of fortification in the Southern Song

The Diaoyucheng Fortress, constructed in 1243, established a paradigm characterized by a fort cluster overseeing rivers, and a "dustpan" form with site on peninsula and protection of long walls. This paradigm was propagated among the Sichuan mountain fortresses, which were

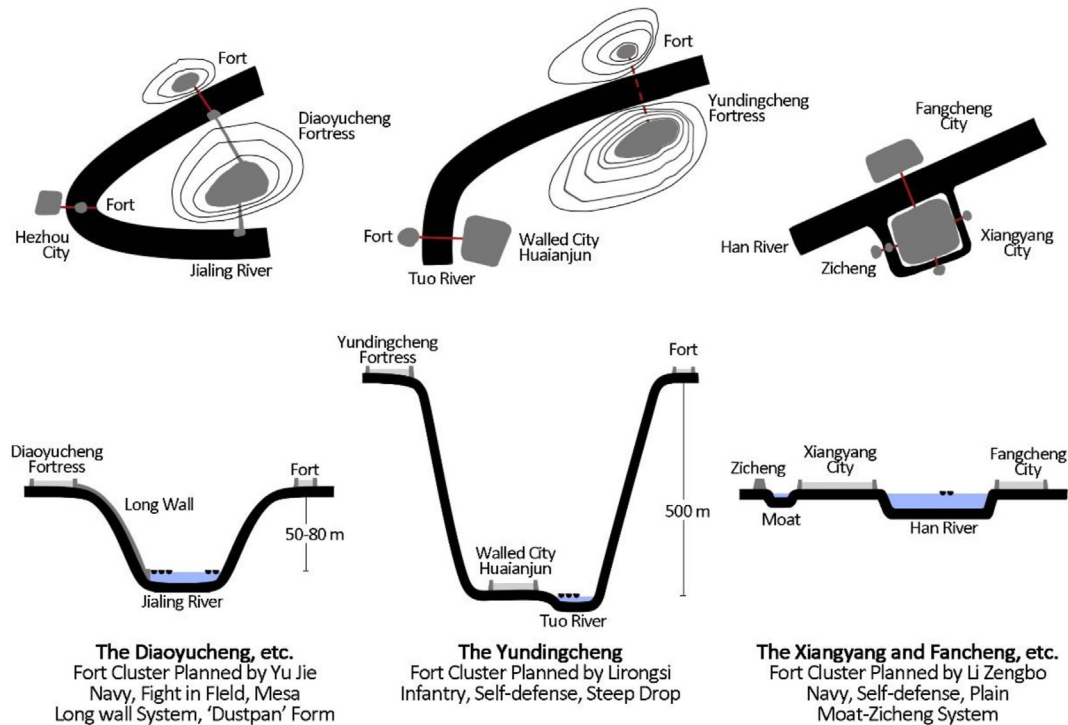


Fig. 16 Three types of river defense fortification (①the Diaoyucheng Fortress; ②the Yundingcheng Fortress; ③the Xiangyang and Fancheng). Source: Huang Wen, 2024.

developed and constructed under the leadership of Yu and his successor, across the river network—namely the Shencheng Fortress, the Xiaoningcheng Fortress, and the Baicheng Fortress. The “dustpa” form emerged as a key feature in river defense fortification during the Song-Jin War, with its earliest implementation at the Guazhou Fort in Zhenjiang, located in the Jianghuai Theater and constructed in 1168. In an effort to stop the Jin troops crossing the Yangtze River, Wang Youzhi, the commander of the army in Zhenjiang, erected two long walls to enhance the Guazhou Fort and augmented its garrison. Subsequently, this pattern was adopted downstream along the Yangtze River, influencing the expansion strategies of cities like Zhenzhou (Huang, 2020). The concept of clustering forts may have originated from Yu, inspired by Yang’s proposal to amalgamate smaller forts into a big stronghold.

The Song Dynasty marked a zenith in ancient Chinese military theory, enriched by the compilation of ancient military classics, private treatises, and the tangible experience of construction and warfare. The formation of this intellectual reservoir was promoted by military strategists, generals, officials, and Emperors. The dynamic interplay between military culture and fortification design during wartime fostered a comprehensive knowledge system of fortification, integrated with military strategy and tactics. *Fashi* (法式), signifying the official standard for form design, emerged as the pinnacle of this evolution, offering dependable guidelines for new constructions, exemplified by the *Yuangfeng Chenghuan Zhidu Fashi* (《元丰城隍制度法式》) and the *Chenfa* (《陈法》) (Fu, 2004). The former, an official treatise promulgated by the Ordnance Department (军器监) around 1075, stipulated the size, form, and trace of city walls (Li, 1979). This document synthesized local technologies and the practical experiences of specialized technical officials during the Song-Western Xia War. It achieved standardization after court discussions and review by Emperor Shenzong. This standard was extensively applied in constructing fortification across the Northern Song’s hinterland and border regions. The latter derived from the *Rules of City Defense* (《守城录》), a monograph by Chen Gui, then governor of Deanfu and Shunchangfu, during 1132–1142. Chen distilled his defensive experiences of these cities during the early Song-Jin War, which was proclaimed as a new official guideline for fortification design by Emperor Xiaozong in 1172. Chen improved upon these precedents, which originally only applied to flat land, by advocating fortaking into account the riverine environment and advancements in firearms technology (Jia, 2012).

The advent and proliferation of the Diaoyucheng Fortress paradigm epitomized the evolution of fortification knowledge system, particularly emphasizing river defense strategies during the late Southern Song Dynasty. From the 12th century onwards, the alterations in territory and geography, along with the rise of naval power, made river advantages as valuable as mountainous ones. This shift facilitated the integration of fortifications with logistical lines, countering nomadic cavalry. By the 1200s, military treatises, such as the *Suggestion of Cuiwei Northern Expedition*, started to explore river defense strategies (Hua, 2005). However, these discussions remained confined to the function and distribution of riverside fortifications, lacking in detailed guidelines or standards for their design. On the other hand,

officials and generals implemented river defense strategies in the planning and construction at the frontier, tailored to geographical conditions, troop types, warfare methods, and specific needs. This approach led to diverse planning principles and design patterns. These practical experiences contributed to the discourse on new fortification planning, as documented in memorials, private notes, and official archives. Through both public and private communications among officials and generals—particularly Military Intendants such as Yu and Li—and established construction mechanisms (with Military Intendants overseeing and local governors executing), these innovative patterns and ideas disseminated, significantly influencing new constructions across all theaters.

The fortification for river defense perhaps had a chance of being incorporated into the Southern Song’s fortification knowledge system, in the form of official standards or military monographies. However, the Mongol conquest terminated the Southern Song Dynasty, and the evolution of the river defense, therefore, ceased abruptly. This culmination was evident in the last fortresses planned by Yu, Li, and other military strategists. Thus, one objective of this study, focusing on the planning and construction of the Diaoyucheng Fortress through archaeological remains and historical documentation, is to unearth and systematize the fragmented knowledge of military theory and fortification design.

5. Conclusion

The transformation of the Diaoyucheng Fortress from a hinterland logistical hub during the Song–Jin War to a frontier mountain fortress during the Song–Mongol War, illustrates its evolving strategic role within the Sichuan Theater. This dynamic shift, influenced by river defense strategies, navy, and topography, not only contributed to a regional defense system, but also established the foundational construction methods and paradigms for subsequent fortresses within the Sichuan Theater. The official construction mechanism—orchestrated by the Military Intendency and supported by local governments and military forces—facilitated the swift transformation of a granary fort into a comprehensive fortress in response to evolving war conditions.

The spatial features of the Diaoyucheng Fortress—characterized by its peninsula site, “dustpan” form, long walls, and clustered mountain forts—melds the elements from the Jianghuai Theater with the strategic ideologies from Yu and his advisors. This paradigm significantly influenced the fortification design across the Sichuan Theater. This communication of planning principle and spatial pattern reflected a development process of the knowledge system of river defense fortification, which was interrupted with the end of the Southern Song. The form design and construction techniques of the Diaoyucheng Fortress, which are the critical components of this knowledge system, will be explored in future research.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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