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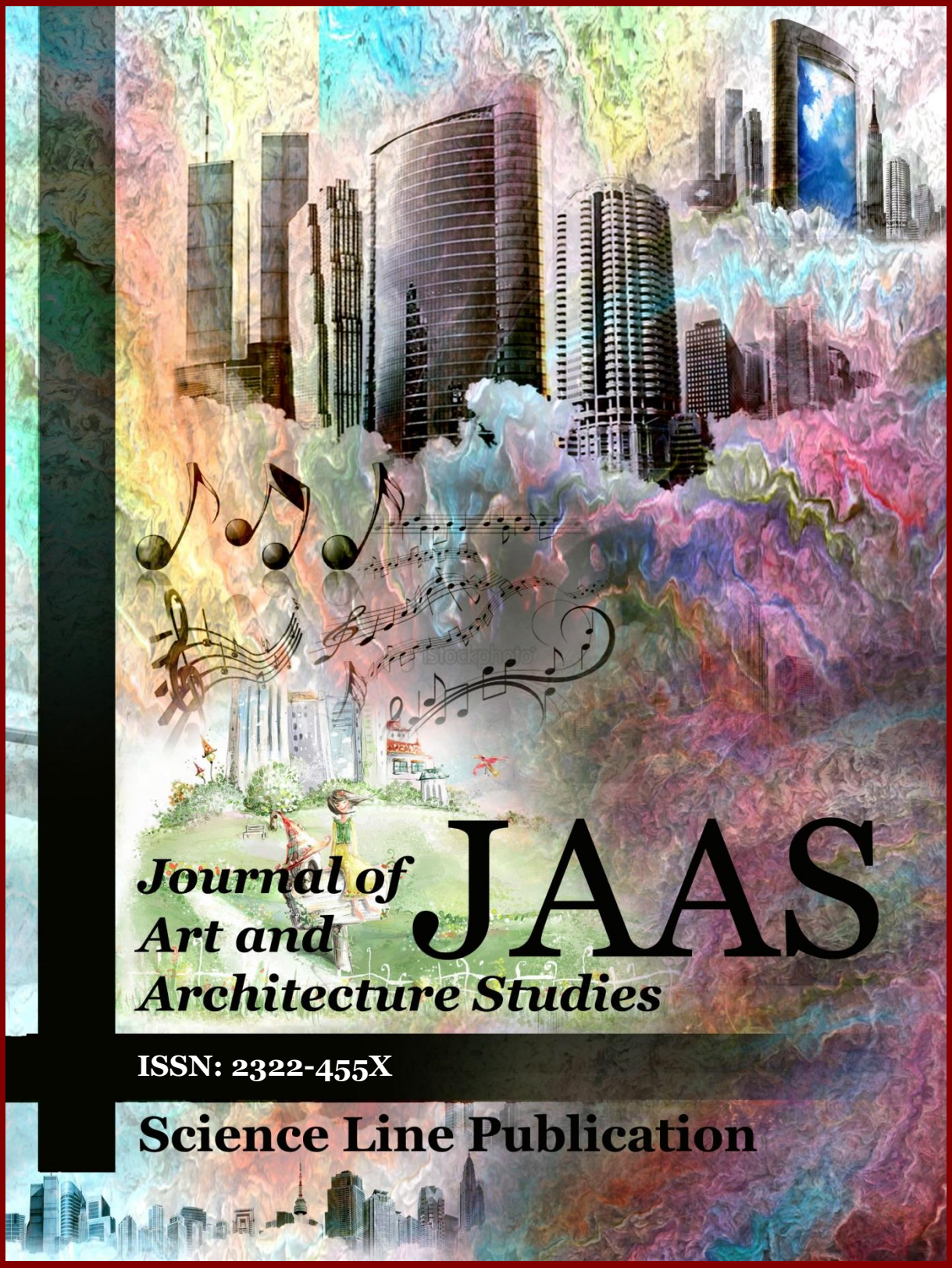

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Research Paper

Art of earth: the ancient city of Gaochang in China on the silk road

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ABSTRACT

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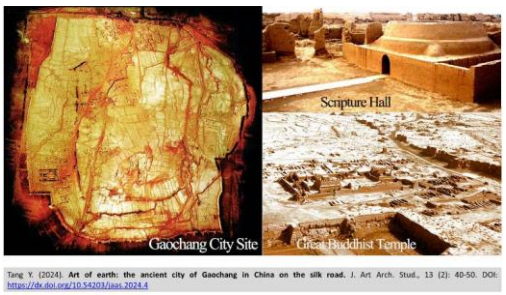

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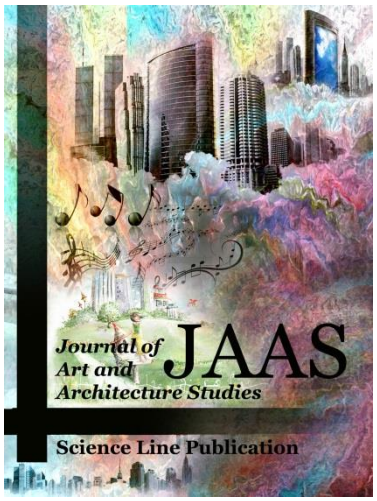

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ART OF EARTH: THE ANCIENT CITY OF GAOCHANG IN CHINA ON THE SILK ROAD

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Research Article

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KEYWORDS: Gaochang, City Site, Morphology, Silk Road, Building Techniques.

INTRODUCTION

Xinjiang Province, historically known as the "Western Regions," is situated on the northwestern border of China and serves as the hinterland of the Eurasian continent. This region is a cultural crossroads, intersecting Chinese, Indian, Arab, and Western civilizations, and is a vital hub on the ancient Silk Road. Throughout its long history, the people of Xinjiang have created a rich cultural legacy, leaving behind a wealth of cultural heritage resources.

The ancient city of Gaochang, referred to as "Yiduhu City" or "King City" in the Uyghur language, is located in the Turpan Basin [1]. It is the most famous ancient city ruins in Xinjiang and one of the most well-preserved and magnificent examples of earthen architecture in the arid regions of Northwest China (Figure 1). Gaochang stands as a remarkable representation of architectural achievement in China and the world.

On June 22, 2014, during the 38th World Heritage Committee meeting held in Doha, Qatar, a joint project between China, Kazakhstan, and Kyrgyzstan successfully listed the segment of the Silk roads known as the "Routes Network of Chang'an - Tianshan Corridor" as a UNESCO World Heritage Site [2]. The following six heritage sites became the first group of world cultural heritage designees in Xinjiang: Beiting City site, Gaochang City site, Jiaohe City site, Subashi Temple Ruins, Kizil Grottoes, and the Keziergaha Beacon Tower.

Figure 1. Location of the Gaochang Ancient City

At the end of the 19th century and the beginning of the 20th century, numerous adventurers and explorers visited modern-day Turpan, the area encompassing the ancient city of Gaochang. These explorers, hailing from Russia, Germany, Japan, Britain, and other countries, collected data, excavated cultural relics, and removed many exquisite murals, statues, public and private documents, and inscriptions [3].

The fine woven silk fabrics and skilled carvings from this region attracted international academic attention, leading to the establishment of "Turfan Studies." As this field of study concentrated

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on Gaochang, it also became known as "Gaochang Studies."

As a significant part of the Xinjiang section of the Silk Road, Gaochang was inhabited for more than 1,400 years, serving as historical evidence of China's governance of the Western Regions. Gaochang contains significant remains that represent the eastward spread of Buddhism and fostered the development and exchange of the Eurasian continental economy, culture, and society from the 2nd century BC to the 16th century. The city played a crucial role in the interaction between nomadic and settled civilizations. Additionally, Gaochang reflects the exchange of urban planning ideas and deeply represents the spread of Buddhism, Manichaeism, Nestorianism, Zoroastrianism, and other religions in ancient China, Central Asia, and beyond.

METHODOLOGY

This research employs an integrated approach to investigate the historical, architectural, and cultural significance of the ancient city of Gaochang. The study combines historical document analysis, archaeological fieldwork, and architectural review to trace the city's development across five distinct historical phases. Primary sources include ancient Chinese texts and inscriptions, complemented by archaeological reports and scholarly studies focused on Gaochang and the broader Turpan region. Comparative analysis with other Silk Road cities is conducted to contextualize Gaochang's urban evolution and its role in religious and cultural exchanges.

Additionally, Geographic Information System (GIS) technology is utilized to examine the spatial organization of Gaochang over different periods, emphasizing shifts in the city's functional zoning, wall configurations, and gate structures. Architectural analysis is supported by site surveys and existing archaeological data, evaluating construction techniques, materials, and structural innovations used in the city's walls, gates, and buildings. The study also includes an examination of artistic and religious artifacts, such as murals and statues, to further illuminate Gaochang's cultural interactions along the Silk Road. These methodologies collectively offer a comprehensive perspective on Gaochang's significance as a key political, economic, and religious center in the Silk Road network.

RESULTS AND DISCUSSION

The geographical position and environmental characteristics

"Turpan" means "the lowest land" in the Uyghur language. It features a unique continental, warm, temperate, and arid desert climate. Situated deep inland, Turpan is characterized by extreme aridity. It lies between the eastern segment of the Tianshan Bogda Mountain and the Jueluotage Mountain, forming the well-known Turpan-Hami Basin. Due to its basin location surrounded by high mountains, heat accumulates quickly and dissipates slowly. The region is distinguished by five major climatic characteristics: long periods of sunshine, high temperatures, large temperature differences between day and night, low rainfall, and strong winds. The average summer temperature is approximately 30°C, with temperatures exceeding 35°C on an average of 99 days and surpassing 40°C on an average of 28 days annually. This extreme heat has earned Turpan the nicknames "Fire State" and "Wind Library."

The Gaochang city site (Figure 2) is located in Harahezhuo Village in Sanbao Town, about 30 kilometers west of Turpan city. It is situated on the alluvial plains at the northern edge of the Turpan Basin and the southern edge of the Flaming Mountains. The Taizang Tower Ruins are 1.5 km north of the Gaochang City site, approximately 3 km north of Astana Cemetery, and about 7 km north of the Flaming Mountains. The Shengjinkou grottoes are located 7.5 km to the northeast.

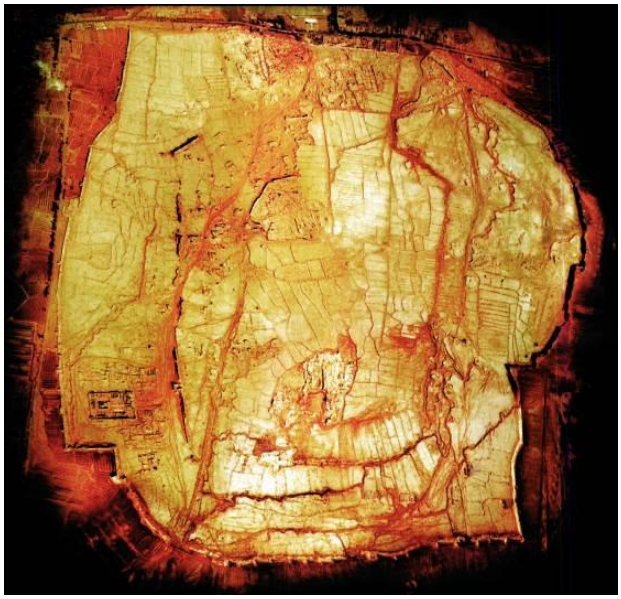

Figure 2. The ancient city site of Gaochang (source: Tao, 2006 [4])

Due to the surrounding mountains and low-lying terrain of the Turpan Basin, the climate is extremely arid. This unique natural environment has facilitated the preservation of ancient cultural heritage. The site of the ancient city of Gaochang is one of the best-preserved ancient city sites in China.

The Gaochang city site is primarily constructed of rammed earth and adobe walls, which exhibit different engineering characteristics. However, the dry climate of Turpan, with minimal rainfall, contributes to the high mechanical strength of the rammed earth, allowing many ancient structures to remain preserved.

Over thousands of years, numerous ancient architectural sites have been subject to varying degrees of destruction due to weathering and erosion in Northwest China. This includes significant sandstorm and wind erosion. Rammed earth structures collapse easily in wet conditions. Even with little rainfall, long-term accumulation causes serious damage. Some earthen sites are plagued with problems, including large-area collapses, showing a potential for devastation.

The history of the ancient city of Gaochang

The ancient city of Gaochang originated as a settlement and garrison fort in the Western Han Dynasty, evolving from a military base into an administrative center during the Wei and Jin Dynasties. Subsequently, the city served as the capital of local authorities or as a state and county under the management of the Chinese Central Government. Gaochang experienced five historical periods: the barrier of Gaochang, the county town of Gaochang, the national capital of Gaochang, the city of the Western State of the Tang Dynasty, and the Uyghur capital of Gaochang. The city was abandoned in the early Ming Dynasty, thus having been inhabited for over 1,400 years [5].

The geographical position of the ancient city of Gaochang is unique. Located at a crossroads on the Silk Road, it was frequently contested by forces from the Central Plains, the grasslands, Central Asia, the Tibetan Plateau, and other regions. This strategic location made Gaochang a political crossroads as well, easily controlled by surrounding powers or tribes. Unrest in neighbouring countries or tribes often had implications for Gaochang's internal regime.

The Gaochang barrier (48 BC - AD 327)

Since Zhang Qian opened the gateway from the Han Dynasty to the Western Regions, the Han Dynasty began focusing on governing these territories. After multiple victories over the Huns, the Han Dynasty established the Anxi Frontier Command in the Western Regions in 60 BC, formally incorporating the region (now known as Xinjiang) into China's territory.

In 48 BC, the Western Han Dynasty received the fertile land of the Jiaohe area, serving as the guardian of the Western Regions' gateway. The government then established a chief in the area and stationed military forces in both Jiaohe and Gaochang. With garrison troops present, peasants began opening up wasteland and cultivating crops. This area became known as the Jiaohe Barrier and the Gaochang Barrier. The Gaochang Barrier is located within the current area of Gaochang city.

The county town of Gaochang (AD 327 - 442)

From the Han Dynasty through the Eastern Jin Dynasty, significant changes occurred in Gaochang. Amidst the chaos in northern China and widespread separatist activities, Gaochang grew stronger, eventually becoming the first county in the history of the Western Regions. Gaochang, located near Liangzhou (modern-day Dunhuang), had a close relationship with it at the time. However, as the central power weakened, Gaochang gradually came under the administration of Liangzhou [6].

Beginning with the Western Han Dynasty's operations in Gaochang and the establishment of the Mita stronghold, Chinese Han settlements began to appear in the eastern part of the Turpan Basin. The Mita soldiers and their families often experienced instability due to the relationship between the Central Plains and the Huns. Although the Gaochang Barrier had become a settlement, it remained in a process of unsustainable and unstable development. However, the early officials, soldiers, residents, and prisoners who came to Gaochang had a positive impact on the city and the entire Western Regions. They not only constructed Gaochang but also transmitted Chinese culture to the Western Regions, laying a foundation for future changes in Gaochang.

In the early Eastern Jin Dynasty (AD 327), the former King Zhangjun, who had established a separatist regime by force west of the Yellow River, transformed the region into Gaochang County.

The national capital of Gaochang (AD 442 - 640)

In September AD 442, the descendants of the Juqu regime established Gaochang as their capital

and became the Liang kings. They later captured Jiaohe and annexed the country of Cheshi, thereby unifying the Turpan area. The Gaochang Kingdom was ruled by sixteen kings from four families (Kan, Zhang, Ma, and Qu), all of whom were Han people, as the residents of the Gaochang Kingdom were primarily of Han nationality. Each regime took Gaochang as its capital, and its politics, military, economy, and culture inevitably followed the characteristics of the Central Plains dynasty.

The city of the western state of the Tang Dynasty (AD 640 - 792)

In AD 640, the Tang Dynasty defeated the Gaochang Kingdom and established the Western State in its place, bringing Gaochang under the administration of the Western States. The Tang Dynasty also established Gaochang County at that time. The Western Regions were unified under the Tang Dynasty, and Gaochang played a significant role in the Tang Dynasty's defense and recovery of the Western Regions during periods of frequent and unpredictable wars. Despite prolonged warfare, the Tang Dynasty eventually unified the Western Regions. However, due to the rebellions of An Lushan and Shi Siming, as well as invasions from the Qinghai-Tibet Plateau, the Tang Dynasty's territory became divided, and the area of Gaochang ultimately came under Tibetan control.

The Uyghur capital of Gaochang (AD 866 - 1383)

Gaochang Uyghur refers to the Uyghurs and the regime they established. The Uyghurs originated from the Mongolian grasslands and migrated to Gaochang (present-day Turpan area), Beiting (present-day Jimsar County), and other places in the 8th century AD. The history of the Gaochang Uyghur regime began with the southward expansion of the Uyghur Khanate in the mid-8th century, leading to the occupation of Beiting and the Western States. The Uyghur leader of Beiting, Pugujun, later conquered the Western States and established the Pugujun family regime, marking the foundation of the Gaochang Uyghur regime. Gaochang and Beiting served as the southern and northern capitals, respectively.

In 1383, Heidierhuozhe became the Khan of Bieshibali. He initiated a "holy war" in the Turpan area, capturing Gaochang and Turpan, and compelling local residents to convert to Islam. Gaochang City was destroyed in the conflict, and as a result, its status was gradually surpassed by the new Turpan City, known as Anle City.

The form and architecture of the Gaochang city site

Currently, the academic community generally agrees that the existing ruins of Gaochang date back to the Uyghur period when Gaochang served as the capital. From the late 19th century to the early 20th century, explorers from Russia, Britain, Germany, France, Japan, and other countries repeatedly visited the Gaochang City site. Although these foreign explorers claimed to be conducting studies, their primary activities involved extracting and removing relics, including documents, scriptures, murals, and coins. Such activities caused severe damage to the Gaochang City site [7]. Over the past century, Chinese scholars have also made significant achievements in researching Gaochang. Renowned Chinese archaeologists such as Wenru Yan and Fanren Meng have made notable contributions to understanding Gaochang's layout. Similarly, abroad, the British Stein's Expedition and the German Grunwedel investigation team have conducted significant studies, although they often had different interpretations of Gaochang's layout [8].

The layout of the city

Urban planning has a long history in ancient China. According to historical records, by the time of the Zhou dynasty (1046 BC), urban planning and construction had developed into a complete and unique theory. This theory influenced ancient Chinese urban planning and construction. The standard pattern in the planning and construction of imperial capital cities, such as Beijing, Xi'an, Luoyang, Nanjing, Shenyang, and other ancient cities, strictly followed these principles. Gaochang society was heavily influenced by Central Plains culture, and its layout inevitably followed the principles of the Central Plains capitals.

The Gaochang City site covers a total area of 2.2 million square meters, with a nearly square plane shape. There are numerous building sites within the city. According to literature and current research, these include palaces, government offices, guest houses, temples, local-style dwelling houses, workshops, and markets. Chinese archaeologist Wenru Yan proposes that Gaochang is composed of three parts based on existing relics: the outer city, the inner city, and the northern end of the imperial city. The outer city is an irregular square surrounded by arc-like walls, which are recessed inwardly at the northwestern corner. The northern half of the east wall protrudes outward. The inner

city is centrally located within the outer city, but south of the imperial city. The imperial city is rectangular and situated at the northernmost part of the city.

North of the city's center is a small fort, known locally as Khan Fort. It is round and may have served as the palace or the imperial city of Gaochang before the Tang Dynasty. The layout of the entire city, with the imperial city in the north and the inner city in the south, closely resembles that of Chang'an City during the Tang Dynasty. However, some experts have different interpretations of the layout of the Gaochang City site [9].

The wall and gate of the city

The city wall is a prominent feature of ancient Chinese cities. In early times, construction materials primarily included rammed earth, though some walls were constructed using tamped earth, as seen in Tongwan City founded by the Huns. While tamped earth walls are notably hard and durable, they are labor-intensive to construct. Consequently, most city walls in ancient China were made of earth, with stones and bricks occasionally used on the exterior or base in a few important cities. The widespread use of masonry walls did not appear until the Ming and Qing Dynasties.

Before the Qin Dynasty, brick-making technology in China was relatively undeveloped, making earth the primary material for city walls. However, during the Han Dynasty, brick-making technology saw significant improvements, leading to more common use of bricks. Constructing city walls was a significant defense project, involving a complete set of defensive facilities. In addition to fixed gates as entry points, the walls were typically complemented by a wide and deep moat, effectively isolating the city from its surroundings.

The outer city wall (Figure 3) of Gaochang remains relatively intact and is roughly square, albeit irregular in shape. The circumference of the outer city wall is approximately 5440 meters, with the northern wall measuring 1320 meters, the western wall 1370 meters, the southern wall 1420 meters, and the eastern wall 1320 meters, enclosing an area of 198 hectares. The conservation of each side of the walls varies, with more than half severely damaged and wall cracks common. Most walls are incomplete, displaying repair marks, and the upper section of the wall is constructed with adobe bricks [10].

The remnants of the outer city wall base range from 9 to 12 meters in thickness, with the highest wall reaching approximately 10 meters. These walls are built with rammed earth, with layers measuring 8 to 12 centimeters thick. The outer walls are reinforced with rectangular piers known as "horse faces" in Chinese, designed to provide defensive angles against enemies. According to early 20th-century records, the city wall stood 15 to 20 meters high, with around 70 remaining "horse faces".

Historical records from the Tang Dynasty's Western State period indicate the presence of numerous canals around Gaochang City, one mile away. These crisscrossing canals, used for irrigation, each had specific names. During the Gaochang Uyghur period, the expansion of the outer city may have been constrained by these canals, resulting in its irregular shape.

Figure 3. Outer City Wall

The inner city wall is centrally located within the outer city of Gaochang, south of the Khan Fort. Constructed entirely of rammed earth, the western and southern sections of the inner city walls are mostly preserved but have experienced significant collapse. An earth platform exists at the southeast corner, with residual wall sections in the middle north and northwest corners. No gate evidence is currently visible from the ground.

The inner city wall's circumference measures approximately 3600 meters. The east wall contains several residual wall bases, while the west wall has only a few remaining sections. The southern wall retains one pier, approximately 8 meters high. The inner city walls suffer from severe damage, primarily due to wall collapse, rain erosion, and human destruction. Two sections of the northern wall's remnants measure 10 meters in width at the base [11].

The imperial city is situated in the northern part of the ruins, with the north wall of the outer city serving as its northern boundary, and the north wall of the inner city as its southern boundary. The

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imperial city has an irregular shape, with only the south, north, and west walls preserved; the east wall is currently missing. All walls are constructed of rammed earth, with residual heights ranging from 6 to 8 meters.

Based on the remaining traces at the Gaochang City site, the west and south sides of the city wall are complete. The western wall contains two gates, with the barbican of the northern gate still preserved. The north and east walls may also have two gates remaining. The southern walls have three gaps, suggesting the possibility of a third gate.

In summary, only one gate can be definitively confirmed at the Gaochang City site: the west gate, located centrally on the western wall. The remaining barbican and main doorway, which are oriented north-south, measure approximately 25 meters in width.

Main architectural remains

In addition to the city walls, the main architectural remains visible at the Gaochang City site are primarily distributed in the north and southwest of the outer city, as well as the south and west of the inner city.

Located in the southwest corner of the outer city, the ruins of a temple known locally as the Great Buddhist Temple are found (Figure 4). This rectangular temple measures 130 meters from east to west and 80 meters from north to south, covering an area of 10,400 square meters. The temple complex includes a gate, courtyard, scripture hall (Figure 5), scripture-stored tower, great hall, and monks' dormitory. The gate is situated on the east side, with a 12-meter-long doorway. West of the Great Buddhist Temple is a tall building base with a square courtyard inside, directly opposite the center of the tower temple ruins [12].

The remaining wall of the temple tower stands approximately 10 meters high, with a robust and wide base in the lower part of the wall (Figure 6). The outer sides of the walls have markings of holes indicating the use of large wooden components. The south side of the tower body preserves Buddhist Niches, with three large Niches in each row in the lower part and three layers of seven small Niches in the upper part (Figure 7), which show traces of plastering and painting [13].

Frescoes on the west wall of the temple tower, analyzed through their patterns, suggest a construction date in the Qushi Gaochang period, around the 6th century AD. Surrounding the temple are numerous square yards, possibly artisan workshops and markets from that era. The entire temple ruins are enclosed by high walls.

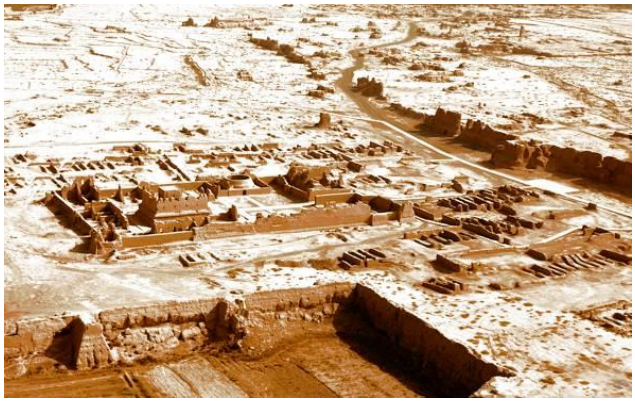

Figure 4. Great Buddhist Temple (source: internet)

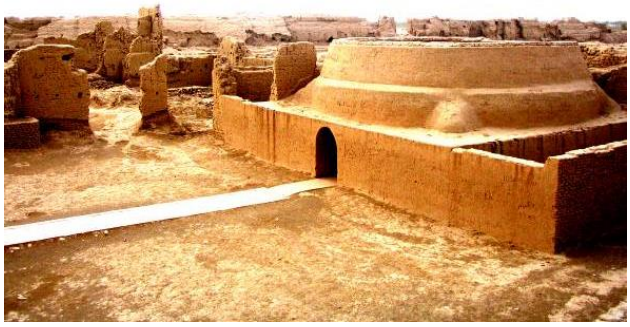

Figure 5. Scripture Hall

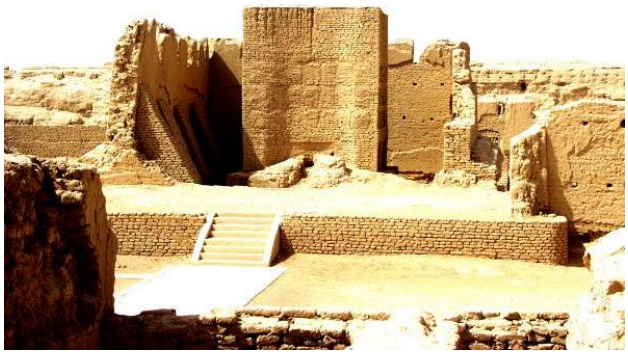

Figure 6. Central Tower Hall

In the southeast corner of the outer city lies another temple, referred to by locals as the Small Buddhist Temple. Presently, only the polygonal base of the tower (Figure 8) and a chaitya are visible. The chaitya contains the only intact frescoes on the site, dating to the Gaochang Uyghur period (9th to 13th

century) based on their style and the tower's shape. The tower, built of adobe, has a residual height of 7 meters, with a square stylobate and a circular tower body, maintaining three layers of preserved shrines [14].

Khan Fort is located on the north side of the Gaochang City site. While the east wall has collapsed and is missing, the west, north, and south walls are still preserved, with residual heights ranging from 6 to 8 meters. The fort is rectangular with a perimeter of 700 meters, and a few remaining bases can be seen in the western wall, reflecting its original shape.

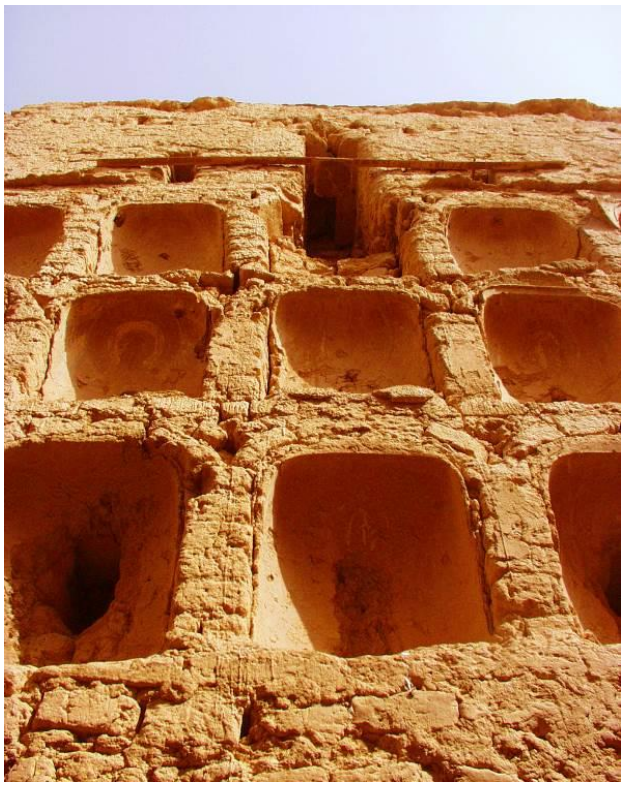

Figure 7. Buddhist Niche

Figure 8. Southeast Tower

Building techniques of the Gaochang city site

The ancient city of Gaochang was inhabited for approximately 1400 years, during which various construction techniques were employed. These techniques reflect the architectural styles and technological levels of different periods and ethnic groups. The general characteristics of the city's construction relied on local conditions, with loess being the primary material. The building techniques preserved at the Gaochang City site can be categorized into four types: rammed-earth masonry, adobe masonry, cave-digging, and mixed methods.

Method of rammed-earth masonry

Most rammed-earth buildings at the Gaochang City site are city walls (Figure 9). The base of the Giant Buddha Temple is also constructed of rammed earth, primarily using nearby loess, though the earth composition varies. Rammed-earth buildings have remained the main architectural form throughout Gaochang's history due to the easy availability of materials and the simplicity of the construction process.

Figure 9. Rammed Earth Wall of the Ancient City of Gaochang

Rammed-earth structures exhibit strong weather resistance in arid and semi-arid areas, aging slowly and maintaining compatibility with the surrounding environment. Despite a thousand years of wind and rain erosion, these structures still exist, though they have lost their original function and structural integrity. This durability highlights the material's weather resistance and structural weaknesses. Most ancient rammed-earth buildings have deteriorated, leaving behind remnants of the original structures [15].

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Rammed-earth masonry techniques can be divided into two types: pure rammed earth, which does not incorporate other construction techniques, and a reinforced method that integrates structural measures. The latter, mainly used in residential buildings, includes adding wood, reed bundles, and red willow during the ramming process. Reinforcement can be horizontal or vertical, with rammed-earth layers typically measuring 8 to 10 millimeters.

Method of adobe masonry

Aside from the city walls, most buildings at the Gaochang City site were constructed using adobe masonry. Adobe bricks typically measure approximately 400 mm × 200 mm × 100 mm. The production process involves adding water to loess, incorporating straw or camel grasses, stirring the mixture into mud, and allowing it to dry naturally in molds. All walls of the Great Buddhist Temple were built using this method, with building materials and technologies akin to modern techniques.

Due to the historical scarcity of wood in the Turpan area, adobe was commonly used to construct arches and roofs at the Gaochang City site. Small arches were built with ordinary adobe, while large arches involved forming an arc at both ends and connecting them (Figure 10). To strengthen adobe structures, various measures such as adding vertical reeds were employed [16].

Figure 10. Adobe Brick Construction

Method of digging cave dwellings

The cave dwellings at the Gaochang City site fall into two categories: vertical earth-layer excavations and caves dug into existing large structures such as walls. These methods were used to create shelters for guards and other functions.

Method of mixed construction

A mixed construction method was used in residential buildings. Walls were built with rammed earth, arches with adobe, and roofs, typically arched structures, were filled with rammed earth. During construction, structural measures such as mud wedges were used to strengthen the connection between adobe and rammed earth.

The situation and analysis of the Gaochang city site

The outer city walls of the Gaochang City site have been relatively well-preserved, in contrast to the inner city walls, which have largely vanished along with most of the city gates. The surviving city buildings are in poor condition, with only a few sites still reflecting their original construction layout and intended functions. The outer city walls exhibit numerous gaps, through which people freely pass, exacerbating the deterioration. Unauthorized construction is a significant issue, especially in the eastern section of the northern city wall, and irrigation canals are situated perilously close to the west wall.

Due to the earthen construction of the city walls and buildings, they are highly susceptible to damage from both natural and human factors.

Natural factors: Wind erosion deteriorates building surfaces, while rain can cause walls to collapse. The substantial temperature variations result in thermal expansion and contraction, leading to cracks. Additionally, melting water causes surface pulverization and exfoliation, and the presence of rat holes and earthquakes also contribute significantly to the damage [17].

Human factors: Human activities such as cultivating crops, digging temporary residences, constructing illegal buildings, and engaging in unauthorized excavation have further damaged the site. Excavations by foreign expeditions in the early 20th century caused substantial destruction of historical relics [18].

The main building sites within Gaochang include palaces, government offices, guest houses, temples, local-style dwellings, workshops, and markets. These sites, which are widely distributed and large in scale, currently face serious damage and degradation.

The valuation of the Gaochang city site

Historical Value

The ancient city of Gaochang served as the political, economic, and cultural center of its time,

connecting the East with the Western Regions and situated at the crossroads of the Silk Road and the Northern Grasslands. Its strategic location made it an essential transportation hub and a site of convergence for various periods, religions, and cultures, leaving behind a rich historical and cultural heritage. Gaochang is a historical witness to the communication between the dynasties of the Central Plains and the Western Regions and was an important town under the central government's control since the Western Han Dynasty. The Turpan region maintained close political, economic, and cultural ties with the Central Plains [19]. However, the historical value of the Gaochang City site is largely based on literature, as empirical evidence is lacking for many critical historical questions.

Scientific value

Abandoned at the end of the 14th century, the Gaochang City site preserves the ancient city's layout relatively intact. It includes the ruins of the outer city, inner city, and Khan Fort. Well-preserved sections of the outer city walls allow for inferences about the original forms of the walls, piers, and channels. The extensive use of rammed earth technology in wall and building foundations is notable, reflecting construction techniques prevalent in northern China before the Tang Dynasty. This preservation offers valuable examples of northern China's rammed earth construction technology and its evolution.

As one of the largest existing ancient city sites in the Xinjiang region, Gaochang serves as an important case study for urban development, human-environment interactions, and cultural exchanges between East and West in Xinjiang and Turpan. The site holds significant academic potential, attracting interest from domestic and international scholars in archaeology, history, and other fields. The ruins and unearthed relics contain abundant historical information, contributing to the fields of sociology, science and technology, and cultural studies. The site also plays a critical role in the disciplines of archaeology, geography, and anthropology [20].

Artistic Value

The ancient city of Gaochang, entirely constructed of earth, presents a vast and impressive ruin. When Russian explorer Sergei Kozlov visited the site in the late 19th century, he remarked, "It is like the ruins of ancient Rome!" The magnificent barbicans and thick walls blend seamlessly with the natural environment, continuously conveying historical and cultural information. The site possesses a strong artistic charm, characteristic of the Western Regions. Compared to the brick walls of Xi'an, Gaochang exhibits a unique beauty of imperfection.

The ruined city of Gaochang, which has endured over a thousand years, captures the vicissitudes of history. In popular imagination, the history of the Western Regions often seems marooned on the desolate shores of the Gobi Desert, overlooked and forgotten. However, Gaochang demonstrates how real life remains intricately connected with historical heritage, preserving its legacy and continuing to inspire awe and reflection [21].

CONCLUSION

The ancient city of Gaochang, constructed during the early Western Han Dynasty and abandoned in the early Ming Dynasty, witnessed extensive vicissitudes and transformations. Initially established to reclaim land and guard border areas during the Western Han Dynasty, Gaochang evolved into the capital city of a county and subsequently the capital of a local authority. Throughout its history, Gaochang experienced five distinct periods: the barrier of Gaochang, the county town of Gaochang, the national capital of Gaochang, the city of the West State of the Tang Dynasty, and the Uyghur capital of Gaochang. The site is a quintessential example for studying the architectural technology and military defense mechanisms of the ancient Western Regions. It uniquely preserves the original size of the city wall, which is a triple wall, the only known ruin from the Chinese Han and Tang dynasties with this characteristic.

Gaochang was the earliest military fortress constructed by the Han people in the Western Regions, serving as a pivotal center for the Han populace. It holds significant religious importance in the history of the Western Regions and is the ancestral homeland of the Uyghur people, who are now distributed across the Tianshan Mountains and other parts of China.

Since Zhang Qian's mission to the Western Regions during the Han Dynasty, the history of the Gaochang region has been intricately intertwined with Chinese history, evolving concurrently. The region epitomizes the broader narrative of Chinese history. Its strategic position made it one of the most important political, economic, and cultural centers of the ancient Western Regions, blending the essence of Eastern and Western cultures [22].

Gaochang stands as a living specimen for studying the ancient science and technology of the Western Region, the Central Plains, Central Asia, and Europe. It reflects the remarkable scientific, technological, and cultural achievements of the ancient Western Regions.

In summary, Gaochang city site is China's largest earthen site, distinguished by its abundant and varied remains. Its historical and artistic values are exceedingly high. Gaochang serves as a quintessential representative of earthen sites in China's northwest arid region and stands as a historical testament to the Chinese nation's management of the Western Regions. Additionally, it is a crucial example of the process of religious communication, possessing irreplaceable historical, scientific, and artistic value.

While significant progress has been made in understanding the history, architecture, and cultural significance of Gaochang, there are still many areas that warrant further investigation. Future research could focus on four key aspects. The first is archaeological exploration and technological advancements, with the potential to uncover new findings and improve preservation techniques. The second is cultural and religious exchanges, exploring the interactions that took place in Gaochang as a cultural crossroads. The third is comparative studies with other ancient cities, which could provide a broader context for Gaochang's development and influence. The fourth is the environmental and climatic impact on urban development, examining how natural factors shaped the rise and decline of the city.

DECLARATIONS

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Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

The author declares that there is no competing interest.

REFERENCES

[1] Yan W (1962). The Ancient City of Gaochang in Turpan, Cultural Relics. 8: 30. Cnki.net

[2] Chen T (2017). Silk Road: The Network of Routes from Chang'an to the Tianshan Corridor, China, Kazakhstan, Kyrgyzstan, World Architecture. 5: 86-87. https://doi.org/10.16414/j.wa.2017.05.070

[3] Chen L, Li J (2016). Study on the Ancient City of Gaochang, Ancient Civilization. 12: 331-334. Cnki.net

[4] Feng T (2006). The Protection Project Brief of Gaochang City Site, Relics and Museolgy. 134 (5): 4-6. Cnki.net

[5] Chen A (2020). World Cultural Heritage: The Ancient City of Gaochang, Xinjiang Art. 2: 124-125. Cnki.net

[6] Wang H (2024). A Study on the Tribute Exchange between Gaochang Uighur and the Central Plains Dynasties. Journal of Shihezi University (Philosophy and Social Sciences Edition), 38(3): 93-95. Cnki.net

[7] Gulinuer H (2021). The Ancient City of Gaochang at the End of the 19th Century and the Beginning of the 20th Century, Turpan Studies. 3: 34-38. https://doi.org/10.14087/j.cnki.65-1268/k.2019.01.005

[8] Liu N, Wang L(2021). Discovery and Archaeological Research of the Ancient City of Gaochang, Cultural Relics World. 10: 103-106. Cnki.net

[9] Jia Y (1983). The Ancient City of Gaochang, Journal of Xinjiang University. 3: 132. https://doi.org/10.13568/j.cnki.issn1000-2820.1983.01.016

[10] Liang T (2009). Analysis of the Current State and Disease Factors of the Ancient City of Gaochang, Dunhuang Research. 3: 107. Cnki.net

[11] Abuduaini A (2016). Research on the Protection and Reinforcement of the City Walls in the Ancient City of Gaochang, Dunhuang Research. 10: 151-155. https://doi.org/10.13584/j.cnki.issn1000-4106.2016.05.024

[12] Lu J, Zhao H (2018). Major Disease Development in the Ruins of the Southwest Great Buddhist Temple in the Ancient City of Gaochang, Turpan Studies. 2: 71-75. https://doi.org/10.14087/j.cnki.65-1268/k.2018.02.007

[13] Liao Z (2024). Re-examination of the Tower Column Form in the Ancient City of Gaochang: With a Discussion on Similar Structures in Yungang Grottoes, Yungang Studies. 4 (1): 1-4. https://doi.org/10.19970/j.cnki.ISSN2096-9708.2024.01.001

[14] Chen A, Wumai K (2013). The Southeast Buddhist Temple and Tibetan Buddhism in the Ancient City of Gaochang, China Tibetan Studies. 4: 86-91. Cnki.net

[15] Mao X, Liu Y, Zhang W (2012). Study on the Building Techniques and Soil Properties of Ancient Ruins of Gaochang, Building science. 28 (2): 46. https://doi.org/10.13614/j.cnki.11-1962/tu.2012.01.016

[16] Hu X, Chen P, Zhao D (2009). Discussion on the Protection Measures for the Earthen Sites in the Ancient City of Gaochang, Journal of Water

Resources and Architectural Engineering. 7 (3): 114-115. Cnki.net

[17] Zhang M, Xu W (2010). Research on Cultural Heritage Protection and Community Participation: A Case Study of the Ancient City of Gaochang, Journal of Minzu University of China (Philosophy and Social Sciences Edition). 37 (3): 36-39. Cnki.net

[18] Yan F (2016). The Cross and Crown in the Manichaean Silk Paintings of the Ancient City of Gaochang: A Case Study of a Silk Painting Excavated by Le Coq in Turpan, Journal of Dunhuang Studies. 9: 175. Cnki.net

[19] Lei F, Shu C (2013). Architectural Form and Value Assessment of the Earthen Sites in the Ancient City of Gaochang, Urban Architecture. 2: 236. https://doi.org/10.19892/j.cnki.csjz.2013.04.201

[20] Li Y (2020). The Buddhist Sculptural Remains and Their Value in the Gaochang Area. Chinese Art, 3: 35. Cnki.net

[21] Cao L, Zhang L (2024). Integration and Mutual Learning: A Study on the Social Life of the People in Gaochang and Tang's Western Prefecture - Focusing on the Documents Unearthed in Turpan. Journal of Xinjiang University (Philosophy and Social Sciences Edition), 52(1): 49-55. https://doi.org/10.13568/j.cnki.issn1000-2820.2024.01.007

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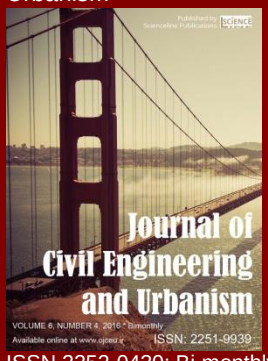

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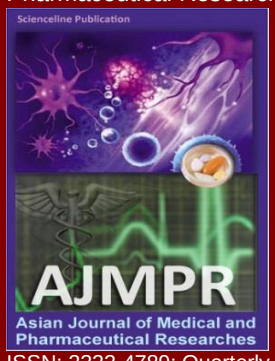

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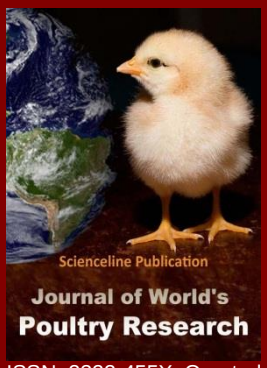

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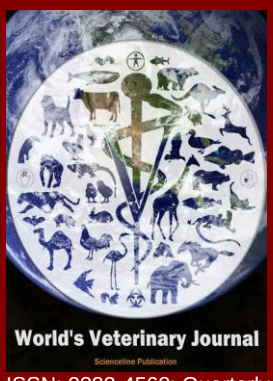

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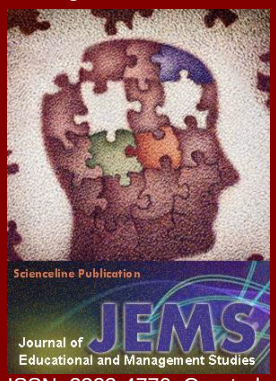

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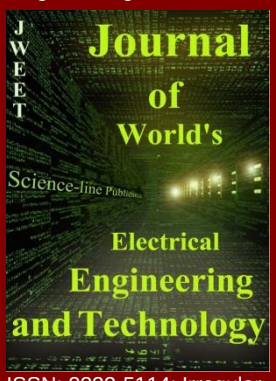

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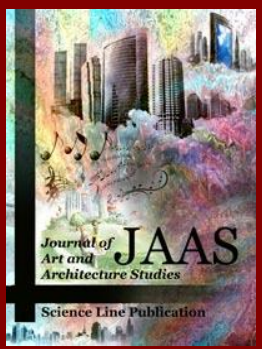

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