EXPLORING THE CONSERVATION OF TRADITIONAL CHINESE TIMBER ARCHITECTURAL CRAFTSMANSHIP THROUGH THE RESTORATION OF BUDDHIST TEMPLES IN SOUTHWEST CHINA

by

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Dedication

This work is dedicated to Liang Sicheng and Lin Huiyin, whose pioneering efforts in the field of architectural heritage conservation have inspired generations.

It is also dedicated to all the guardians of ancient architectural sites and cultural heritage around the world, whose tireless efforts ensure that the beauty and stories of the past endure for future generations.

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Abstract

In 2009, Chinese traditional architectural craftsmanship for timber-framed structures was inscribed on the Representative List of the Intangible Cultural Heritage of Humanity by the United Nations Educational, Scientific and Cultural Organization (UNESCO).[1] Chinese traditional timber architecture is known for its complex joinery and resilience to earthquakes. The focus of this study is on the essential importance of, challenges in, and techniques for maintaining the traditional craftsmanship of Chinese timber architecture, particularly in the context of Buddhist temple restoration in Southwest China. As urbanization and modernization pose risks to ancient temples, safeguarding their profound historical, cultural, and technical significance becomes crucial. This study provides both theoretical and practical assistance in maintaining and inheriting the traditional craftsmanship of Chinese timber architecture, fostering sustainable temple restoration, and promoting the fusion of cultural heritage conservation with sustainable growth. The study first delves into design and construction methods used in Buddhist temples across northern and southern China, focusing on important aspects like wooden architecture, sculpting, and painting. The discussion then shifts to the difficulties encountered, such as structural deterioration and the aging of materials. The study examines age-old restoration methods and discusses the incorporation of contemporary technology in sustainable restoration efforts. An analysis of the restoration of the Guanyin Temple and the Chunyang Guan Temple in Southwest China offers valuable perspectives and insights. Chinese wooden structure architecture reflects not only traditional culture but also Chinese wisdom about dialogue between

[1] UNESCO Intangible Cultural Heritage, "Chinese traditional architectural craftsmanship for timber-framed structures," accessed October 10, 2024, https://ich.unesco.org/en/RL/chinese-traditional-architectural-craftsmanship-for-timber-framed-structures-00223.

humans and nature, technology and humanities, and past and future. Maintaining Chinese wooden buildings contributes to the great rejuvenation of the Chinese nation.

Introduction

The conservation of timber architecture is a challenging process across the world. The conservation methods used by different countries may vary, but they have the same goal, which is to restore and protect ancient structures. For instance, in Kenya, ancient wooden buildings are restored by replacing decayed wooden components with anti-corrosion components and using modern technology, such as grouting and scaffolding; heavily damaged components that cannot be repaired using traditional methods are replaced with similar modern components.[2] In Japan, the conservation of ancient cultural heritage focuses on authenticity; the Nara Document on Authenticity states that authenticity plays a fundamental role in conservation and restoration planning of cultural heritage and that it can be affected by form and design, materials used, functions, traditions and techniques, and location and setting.[3] Similarly, in the United States, the shotgun houses built in the 1900s embody cultural heritage, and they provide sustainability through their small footprint and basic construction methods using old-growth wood materials; conserving these structures means training a new generation of craftspeople skilled in traditional building methods.[4]

China has long been actively involved in cultural heritage conservation, especially of ancient timber temples. Studying timber conservation in China is important because the country has a rich history of timber construction, especially temple construction, which is important cultural heritage for the country. Temples have been integral to Chinese religious life. They are

[2] Zhiwei Zeng, "Examples of Foreign Ancient Architectural Restoration Projects," Science and Technology Consulting Herald.
[3] UNESCO, "The Nara Document on Authenticity."
[4] Claudia Geurra, "Lessons from American Vernacular Houses: People, Planet, Prosperity, Peace, and Partnerships," *Preservation, Sustainability, and Equity*, Columbia GSAPP.

not only a place of worship but also a space for community. They reflect the beliefs and values of the societies that built them. They lie in an intersection of religiosity, art, and architecture. The large number of ancient temples that exist in China reflect the glory of Chinese culture and support the economy of the country through tourism.

The first chapter of this thesis introduces wooden temples in China by summarizing types of Buddhist temple construction, the history of wooden Buddhist temples in China, important characteristics of these temples, and the distribution of these temples throughout the country. This chapter aims to provide a concise understanding of how ancient wooden temples were built and what they represent in relation to Chinese history and culture. The focus of the thesis is on ancient Buddhist temple architecture in Southwest China. The majority of ancient temples in Southwest China are made of wood, which is not usual because wood was the preferred material for construction in ancient China. During the Qin and Han Dynasties (221 BCE-220 CE), wooden architecture witnessed great development; the frames unearthed for the ancient Hunan Temple used the Dougong method of wooden construction.[5] During the Wei, Jin, and Southern and Northern Dynasties (220-589 CE), the construction of Buddhist temples was vigorous because of the rise and adoption of Buddhism in China. During the Sui and Tang Dynasties (589-907 CE), Buddhism and Daoism flourished, so temple construction was accelerated; architects during those periods also constructed temples using timber.[6]

Buddhism was imported from India but underwent Sinicization in China, which led to the development of not only unique Buddhist practices but also temple architecture styles that

[5] Chunrong Hao, 郝春荣 "The Prospect of Chinese Wooden Structure Building from the Development of Chinese and Western Wooden Structure Building," 从中西木结构建筑的发展看中国木结构建筑的前景 Master's Thesis, Tsinghua University, 清华大学硕士论文, 2004.

[6] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.

flourished over centuries. As one dynasty was succeeded by another, ancient construction methods and architectural styles were adopted as well as modified. The type and design of traditional Chinese temples are also influenced by environmental factors in the region. Wooden structures are primarily concentrated in Southwest China, while stone structures are mainly found in the northern region.[7] The local culture of the region can also significantly impact the architecture of the structures. Likewise, significant distinctions can be observed between the northern and southern architectural styles. In the northern region, the climate is colder, so the temples feature steep inclines that help reduce snow pressure on the structure, while in the southern region, temples are built with an emphasis on ventilation due to high levels of humidity.[8]

The second chapter focuses on conservation challenges and strategies regarding ancient wooden temples. This chapter describes how difficult it can be to restore ancient wooden temples in China and what methods can be appropriate. The impacts of the environment are discussed in detail. While traditional wooden architecture is strong and resilient, environmental elements, such as moisture, humidity, and temperature on historic wooden temples can negatively impact their structural integrity because wood is prone to decay and damage as it interacts with the environment.[9] In order to mitigate these issues, the important strategies include regular inspections, timely repairs, and appropriate restoration techniques. This chapter describes effective conservation and restoration methods and discusses the guiding principles of conservation of cultural heritage used by the Chinese government. It also explores how modern methods can be used to restore ancient structures.

[7] Liang, 梁思成 and Lin 林徽因, History of Chinese Architecture.
[8] Liang, 梁思成 and Lin 林徽因, History of Chinese Architecture.
[9] J. Y., R. Wang, Stirling, Paul I. Morris, A. Taylor, J. Lloyed, G. Kirker, S. Lebow, and M. E. Mankowski, "Durability of mass timber structures: A review of the biological risks," Wood and Fiber Science 50, (2018)

The third chapter compares two significant examples of ancient wooden temples, the Guanyin Temple and the Chunyang Guan Temple. Both of them are located in the Xinjin region of Southwest China. They share some similarities in terms of religious and historical significance, but they are very different, as they were built in different time periods and have been provided different levels of protection by the government. While the Guanyin Temple is used as a case study of unprotected cultural heritage, the Chunyang Guan Temple is an example of well-conserved cultural heritage. By studying the history and characteristics of these two temples, a deeper understanding of the importance of ancient temples can be developed, which will justify why these structures need to be protected and conserved. This chapter highlights how not all temples can be provided equal protection, and one of the main factors affecting conservation is the involvement of the community. Unlike the Guanyin Temple, the Chunyang Guan Temple has been an important part of the life for people living in the area. The temple served different purposes during times of war and crises, and now it has been turned into a museum. This shows that ancient temples may be able to survive if they adapt to modern changes. This study will provide valuable insights into protecting traditional Chinese timber architectural craftsmanship, promoting sustainable temple restoration, and advancing cultural heritage conservation.

The fourth chapter highlights the importance of proper restoration of historic temples by examining and comparing successful and unsuccessful restoration projects, discussing the role of government in restoration, and addressing cultural significance in restoration. Restoring and conserving ancient temples protects the history and culture of the country. There are thousands of ancient wooden temples in China, and while most of them are successfully restored, there are also examples of temples that have lost their cultural and historical integrity due to failed

restoration attempts. Many of these ancient wooden temples face increasing neglect and deterioration due to the religious decline in Chinese society. The example of Dabei Pavilion in Dazu is used to discuss a successful restoration, while the example of the Anye Grottoes of Sichuan represents an unsuccessful restoration. This chapter also highlights the work done by the Chinese government in the area of conservation of ancient wooden temples. Policies and laws insist that the restoration of religious buildings maintains their original historical appearance and cultural characteristics. The Chinese government implemented the Cultural Relics Protection Law in 1982 to manage and protect cultural heritage sites, and since 2006, the country has celebrated Chinese Cultural Heritage Day to raise public awareness.

This thesis aims to provide a deeper understanding of the conservation of ancient wooden temples in the context of China. It provides background on the tradition of temple construction, explains its development over centuries, and analyzes why and how those ancient temples should be conserved. One of the main reasons why so many ancient temples still exist in China is the utilization of traditional wood architecture methods. This underscores that wood was critical to ancient temple construction. Chinese temple architecture is not only exquisite and magnificent but also strong and resilient, despite its susceptibility to environmental elements. These temples are important because they serve as evidence of the historical and cultural evolution of the country, so their restoration processes must emphasize authenticity and integrity. Without a proper understanding of the cultural and historical significance of the ancient structures, restoration projects will likely fail, which can have adverse consequences that can risk the survival of these ancient structures.

Chapter 1: An Overview of Wooden Buddhist Temples in China

This chapter discusses the history and development of wooden temple construction with a focus on Buddhist temples. Buddhism has played an important role in Chinese culture, which can be observed in the ancient temple architecture. Most ancient temples in China were built using wood, and many of them still exist. This shows that the construction methods used by ancient architects and builders were effective. These temples are indeed places of worship, but they also have significant cultural significance. They have witnessed the rise and fall of different dynasties, and in their architecture, the influences of those dynasties can be seen. They provide a glimpse into the past and help present and future generations learn about the glorious past of their country.

Types of Temple Construction in China

Chinese temples exhibit a diverse range of architectural styles. These ancient temples represent the exquisite craftsmanship of ancient Chinese architecture and embody deep religious and cultural meanings. The variety of Buddhist temples across China reflects the unique features of their respective regions as they are influenced by local resources, climate, and historical contexts. Chinese Buddhist temple architecture can be classified into several categories based on style and material, but in this chapter, four prominent types are emphasized: wooden structures, grotto temples, Potala Palace-style temples, and masonry temples.

Wooden Temples

Wood has been used to construct temples in China for thousands of years. They are most common in regions with abundant timber resources, such as Southwest China. Ancient wooden temples are constructed in a way that the architecture of the temple complements the natural environment of the site.[10]

The most important aspect of wooden temples is that they are designed to harmonize with their natural surroundings, particularly in mountains or forests. It is based on the Buddhist value of harmony with nature. These temples integrate nature into their architecture, creating a unique cultural tapestry that enhances the spiritual experience for temple visitors. They can feel a connection between their spiritual practices and the beauty of the natural world.

The layout of wooden temples often adheres to the traditional Chinese architectural design. The key components of a wooden Buddhist temple are a central courtyard, various halls, and pavilions; the main hall is where the principal Buddha statue resides, and there are also other halls dedicated to Bodhisattvas; there are also lecture halls for teaching Buddhist doctrines.[11] These temples are constructed using local materials and techniques that reflect regional characteristics. Different regions may have different timber species, and their properties may differ, so artisans use appropriate techniques to match the properties of the material used. Also, some wooden temples have elaborate roof designs with upturned eaves, while other temples incorporate decorative tiles. For example, Nanchan temple as shown in Figure 1.1, located in Wutai Mountain and built during the Tang Dynasty (618-907 CE), is one of the most significant

[10] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[11] Gannan Zhu, and Feng Lin, "Analyze the Characteristics of Chinese Temple Structure and Layout," China Academic Journal Electronic Publishing House, (2013).

wooden Buddhist temples in China; it is characterized by simple, unadorned structure and harmonious proportions.[12]

Figure 1.1: Nanchan Temple in Shanxi. Image source: Shanxi Provincial Bureau of Culture, Sport, and Tourism.

Wood is an excellent building material because it is a natural insulator, and its flexibility makes it resilient to seismic activities.[13] The aesthetic appeal of the temple is also enhanced by the natural grain and color of wood as well as intricate carvings and paintings that reflect religious and cultural themes.

[12] Yuanhe Li, 李元和 "Study on Static Characteristics of Chinese Typical Dougong Wooden Structure," 中国典型斗拱木结构静力学特性研究 PhD diss., Mongolia Agricultural University, 2003.
[13] Jianguo Zheng, Jian Xu, Chunyu Qian, Qifang Xie, and Long Wang, "Research on Some Key Techniques of Earthquake Resistance and Vibration Control of Ancient Buildings," The Journal of Civil Engineering (2023).

Grotto Temples

Grotto temples are carved directly into mountains, rocks, or cliffs. This architectural style originated in India, and during the early centuries of Buddhist influence in China, it rapidly spread in Northwest China.[14] These temples often feature elaborate murals and statues that depict various Buddhist themes. They exist within nature, so they illustrate a harmonious relationship between human spirituality and the natural world.[15]

Some of the main characteristics of grotto temples are integration with nature, artistic expression, and religious significance. These temples are often seamlessly carved into cliffs and rocks, so they blend harmoniously with their natural surroundings. It enhances the spiritual atmosphere of the space. The sculptures and murals found within grotto temples illustrate the evolution of Buddhist art in China. They reflect various dynastic influences and cultural exchanges along the Silk Road and show how art evolved over time. Grotto temples serve as places of worship as well as meditation; they are pilgrimage sites due to their spiritual importance.

Prominent examples of grotto temples are the Mogao Caves in Dunhuang and the Yungang Grottoes in Shanxi. As shown in Figure 1.2, the Mogao Caves were built in 366 CE, and they consist of thousands of images and murals of Buddha, which reflect a fusion of Chinese, Indian, and Central Asian artistic influences.[16] They are an important cultural heritage site in China because they served as a critical center for Buddhist scholarship and artistry along the Silk Road. Similarly, Yungang Grottoes are also famous for their massive stone-carved

[14] Xuetao Li, "Historical Reflections on the Sinicization of Buddhism–Starting from Xie Lingyun and Zan Ning's Understanding of Chinese Buddhism," (2024).
[15] Yao Wang, "Investigation of Temple Grottoes in Southeast Jin Region," China Academic Journal Electronic Publishing House.
[16] Chao Ma, 马超 "Research on Decorative Pattern Design of Chinese Buddhist Temples," 中国佛教寺院装饰图案设计研 Master's Thesis, Hebei University of Technology, 2017.

Buddhas and intricate reliefs; they were built between 460 and 525 CE. They represent the grandeur and magnificence of early Chinese Buddhist art and architecture.[17]

Figure 1.2: Mogao Grottoes, Dunhuang City, Gansu Province. Image source: Dunhuang Research Academy.

Since grotto temples are carved out of rocks and stones, they are generally more resistant to environmental degradation than wooden structures, but they still face conservation challenges.

[17] Rongfang Zhang, "Chen Yuan and the Modern Transformation of the Study of Chinese Buddhist History," (2016).

Environmental factors such as erosion can cause significant damage to grotto temples, and similarly, pollution and human activities, such as encroachment, can also threaten the integrity of these temples.[18] Conservation efforts need to be adequate and consistent to maintain their historical and cultural significance.

These temples play an integral role in understanding the adaptation of Buddhism in China. The development of grotto structures reflects the amalgamation of foreign influence and local expression. Buddhism flourished under imperial patronage during the Northern and Southern Dynasties (386–589 CE) and the Tang Dynasty (618–907 CE), and during these times, the construction of grotto temples increased.[19] These temples showcase the early evolution of Chinese Buddhism; this architectural style has Indian influences, and the way nature and religion are integrated into the architecture adds to the grandeur of these temples. It is a unique temple construction method that highlights the diversity of Chinese architecture.

Potala Palace-style Temples

As the name suggests, Potala Palace-style temples are inspired by the Potala Palace, the former winter palace of the Dalai Lamas in Lhasa, Tibet. These temples are predominantly found in the Tibetan Plateau, and their architectural style is based on the Tibetan Buddhist tradition. These temples are remarkable for their architectural diversity; they often use a combination of materials, such as stone and wood.[20] They are more than places of worship, as they embody a fusion of religious significance and cultural heritage. Architecture and spirituality are combined

[18] Yao Wang, "Investigation of Temple Grottoes in Southeast Jin Region," China Academic Journal Electronic Publishing House.
[19] Huixia Chai, "North Cave Temple Fair and Its Performance Customs," Journal of Longdong University 34, No. 3 (2023).
[20] Huaiying Jiang, 蒋怀英 "Several Problems in the Evolution of Tibetan Temple Architecture from the Perspective of Budara Guan,"从布达拉宫的角度看西藏寺庙建筑演变中的几个问题 China Academic Journal Electronic Publishing House.

in this construction method. This architectural form merges the features of a palace with those of a Buddhist temple. The main characteristics of these temples are grand scale and intricate design. They reflect both religious and political importance. They are typically constructed on elevated terrains and hills and are designed to resemble palaces that feature multiple levels.[21]

Figure 1.3: Potala Palace in Lhasa, Tibet. Image source: Tibet Culture, Sports, and Tourism Bureau.

The Potala Palace in Tibet, as shown in Figure 1.3, was built in 1645 CE. Though not solely a temple, it serves as a monumental symbol of Tibetan Buddhism and incorporates elements from Tibetan culture. The palace was constructed using diverse materials, such as wood, stone, and clay, skillfully combined to build the massive structure with thousands of

[21] Maji Wan, "The Study of Stone Wall Building Artistry Cultural with Tibetan Lamasery–Taking Ningba Village Xunhua Country Qinghai Province as Example," Master's Thesis, Northwest University for Nationalities, 2013.

rooms and more than 200,000 statues.[22] An important example of this architectural style in China is the Labrang Monastery in Gansu. This temple was built in 1709 CE, and it combines Tibetan and Han architectural styles, illustrating the cultural exchanges between the two ethnic groups in China.[23] It serves as a significant center for Tibetan Buddhism outside of Tibet.

Potala Palace-style temples play a critical role in the cultural and religious landscape of Tibetan Buddhism. They are places of worship, meditation, and rituals. They help devotees develop a deeper spiritual connection. These temples also house extremely valuable artifacts, scriptures, and artworks and support cultural conservation by documenting the evolution of Buddhist practices over centuries. They attract pilgrims from across Tibet, which facilitates cultural exchange among diverse communities. There is an important symbolism in the architecture of Potala Palace-style temples. The use of white and red color symbolizes purity and protection, respectively, and the elevation of these temples signifies their spiritual importance.[24] They integrate various architectural elements from different cultures, which shows how Tibetan Buddhism has evolved through cultural exchange. Potala Palace-style temples are indeed remarkable feats of construction technology. They reflect the architectural evolution influenced by local resources, geography, and religious practices. Thus, this architectural style is unique and advanced.

[22] Huaiying Jiang, 蒋怀英 "Several Problems in the Evolution of Tibetan Temple Architecture from the Perspective of Budara Guan,"从布达拉宫的角度看西藏寺庙建筑演变中的几个问题 China Academic Journal Electronic Publishing House.
[23] Jiang, 蒋怀英 "Several Problems in the Evolution of Tibetan Temple Architecture from the Perspective of Budara Guan."
[24] Maji Wan, "The Study of Stone Wall Building Artistry Cultural with Tibetan Lamasery–Taking Ningba Village Xunhua Country Qinghai Province as Example," Master's Thesis, Northwest University for Nationalities, 2013.

Masonry Temples

Masonry temples are also an important part of Chinese temple architecture, especially in the northern regions where timber is less abundant. These robust structures are built using highly durable materials, such as stone and brick, so they have enhanced resistance to environmental factors. Stones are held together using a binding paste that is made from different materials, such as clay, soil, volcanic ash, and limestone.[25] It is similar to how bricks are held together using mortar in modern construction. The development of masonry temples coincided with the rise of Buddhism in China. Early Buddhist temples followed Indian styles, and as Buddhism became more integrated into Chinese culture, temple designs were shaped by local influences.[26] In regions with harsh climates and fewer timber resources, masonry temples became popular. These temples were larger and more complex structures that could accommodate large numbers of visitors. Some of the famous masonry temples were built during the Tang Dynasty (618-907 CE).

The main characteristics of masonry temples are dignified appearance and structural stability. They are designed to reflect the local architectural styles and cultural influences. Intricate and detailed carvings are featured in the design of the temples. In addition to enhancing the durability of the temples, stone contributes to their permanence and grandeur. They are usually constructed from stone, but there are also other materials that can be used to build these temples, such as brick and wood.[27] Some masonry temples incorporate wooden elements in their

[25] Maji Wan, "The Study of Stone Wall Building Artistry Cultural with Tibetan Lamasery–Taking Ningba Village Xunhua Country Qinghai Province as Example," Master's Thesis, Northwest University for Nationalities, 2013.
[26] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[27] Tian Li, 李田 "Health Evaluation and Research of 20th Century Brick and Wood Architectural Heritage in Beijing," 北京 20 世纪砖木建筑遗产健康评估与研究 Master's Thesis, Beijing University of Technology, 北京工业大学硕士论文 2017.

roofs and decorative features. Masonry temples blend different materials, which highlights the adaptability of Chinese temple architecture. It can be observed in various historical sites where wooden beams complement stone walls.

Figure 1.4: Big Wild Goose Pagoda in Xi'an. Photo by Author.

In northern China, a harsher climate requires more resilient building materials. Masonry temples made of stones are prevalent in regions like Shanxi due to the availability of local resources; in contrast, wooden temples dominate southern China because timber is more

abundant and the climate is not harsh.[28] One of the prime examples of masonry temple architecture is the Big Wild Goose Pagoda in Xi'an, built during the Sui Dynasty (581-618 CE) and expanded during the Tang Dynasty (618-907 CE). As shown in Figure 1.4, it features a five-story stone pagoda, which was originally intended to store Buddhist scriptures and relics brought back from India.[29] It is one of the most iconic representations of ancient Chinese Buddhist architecture. The design of this temple emphasizes both functionality and aesthetics. It reflects traditional Chinese architectural principles and also integrates Buddhist symbolism. Masonry temples are important cultural heritage in regions where timber is scarce, and they show how local materials were used by ancient architects to build massive structures.

Origin and Development of Wooden Buddhist Temples in China

Wooden structures are deeply embedded in Chinese traditional construction practices. The history of Chinese wooden structures spans millennia and can be traced back to the Shang and Zhou Dynasties (1600-256 BCE). Ancient architects and builders used wood for its availability, flexibility, and durability. Traditional construction techniques made Buddhist temples not only aesthetically pleasing but also structurally sound.

As craftsmanship advanced, wooden structures developed from basic functional spaces into more sophisticated architecture characterized by distinct styles and construction methods.[30] During the Qin and Han Dynasties (221 BCE-220 CE), there were significant improvements in

[28] Dong, Mengyu, Haibin Zhou, Xiaomei Jiang, Yun Lu, Weibin Wang, and Yafang Yin. "Wood Used in Ancient Timber Architecture in Shanxi Province, China." 中国山西省古代木结构建筑中使用的木材 IAWA Journal 38, No. 2 (2017).
[29] "The Great Wild Goose Pagoda," China Daily, accessed October 15, 2024, https://www.chinadaily.com.cn/m/daminggong/2010-05/13/content_9845518.htm
[30] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.

wood-frame construction, such as the method of mortise and tenon joint and beam-column systems.[31]

These innovative techniques laid the groundwork for more sophisticated architectural styles in later dynasties. Ancient architects were able to achieve greater stability and flexibility in design because of those techniques, so they built larger and more complex structures that could withstand the impact of environmental factors as well as natural disasters. They were able to manipulate wood to construct sturdy structures. Over time, the architectural design of wooden structures changed. Different dynasties focused on different aesthetics, which influenced the architecture of wooden structures.

Thousands of ancient wooden temples exist today as the legacy of traditional Chinese wooden architecture, and they exemplify the evolution of construction methods and aesthetic values across various dynasties.

Han Dynasty (206 BCE-220 CE)

The Qin and Han Dynasties (221 BCE-220 CE) saw significant improvements in wood-frame construction, such as mortise and tenon joinery and beam-column systems.[32] When Buddhism entered China from China during the Han Dynasty (206 BCE-220 CE), it led to not only the country's cultural evolution but also the development of a distinctive form of architectural expression.[33] Despite being imported from another culture, Buddhism was combined with Chinese philosophy and traditions, so it became closely connected with Chinese

[31] Mengqian Yang, Yangguang Hao, and Ling Yu, "Analysis on the Innovative Application of Mortise and Tenon Structure in Modern Architecture," China Academic Journal Electronic Publishing House.
[32] Mengqian Yang, Yangguang Hao, and Ling Yu, "Analysis on the Innovative Application of Mortise and Tenon Structure in Modern Architecture," China Academic Journal Electronic Publishing House.
[33] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.

society.[34] As a result, Buddhism is seen in China as both religion and culture. Buddhist temples–especially the old ones, which were built of wood–became central to religious practices and the broader cultural and artistic landscape of China. The architectural design of these temples, such as open courtyards, reflected Buddhist values and ideals, such as peace, spiritual enlightenment, and connection to nature.[35] The first temples in the Han Dynasty used a simple combination of front pagoda and back temple. They typically featured a two-story pavilion in a quadrilateral courtyard with a column-shaped stupa, which serves as a place for meditation, on the roof and a seven-story wheel on the top.[36] An example of a stupa can be shown in Figure 1.5.

[34] Kai Sheng, "The Relationship and Boundary between Chinese Buddhist Culture and Chinese Excellent Traditional Culture," Anthology and Introduction of Buddhist Time Concept Literature, 2023.
[35] Jing Chen. "A Study on the Visual Features of the Spatial Structure of Buddhist Temples in Southern Jiangsu." 苏南地区佛教寺庙空间结构的视觉特征研究 Master's Thesis, Suzhou University of Science and Technology, 苏州科技大学硕士论文, 2002.
[36] Yanqing Gao, "Chinese Buddhist Monastery Architecture Historical Change," Mudanjiang Normal University.

Figure 1.5: QingYang Temple, Chengdu. Photo by Author.

Wei (220-256 CE), Jin (265-420 CE), and North/South Dynasties (220-589 CE)

During the Wei, Jin, and North/South Dynasties, the construction of Buddhist temples increased due to the rise in Buddhism, and these temples became central to religious practices.[37] Buddhism existed alongside Daoism and Confucianism during those periods. Although it was an imported religion, it quickly penetrated Chinese society. Buddhist was integrated with Confucian

[37] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.

and Daoist culture, creating a unique Buddist culture with Chinese characteristics.[38] The architects of those periods started to merge traditional wooden architectural techniques with Buddhist design elements, which ensured that the temples met both functional and aesthetic needs. There was a harmony between structure and spirituality. For example, during the Northern Wei Dynasty, temples with extremely tall pagodas were built to show the glory of Buddhism.

Sui and Tang Dynasties (581-907 CE)

The pinnacle of wooden temple architecture was reached during the Sui and Tang Dynasties. Cities like Chang'an became renowned for extensive networks of Buddhist temples, showcasing architectural innovation.[39] One of the notable examples from this period is the Nanchan Temple, as shown in Figure 1.1. It was built in 782 CE and is one of the oldest surviving wooden structures in China; it features a single-eaved Xieshan roof, which has nine ridges and is composed of two slopes and four surrounding corridors.[40] This temple exemplifies the architectural ingenuity of the Tang Dynasty (618-907 CE), and it provides insight into the spatial aesthetics during those times. During the Tang Dynasty, the design of Buddhist temples emphasized simplicity and grand scale; temples were built with multiple tiers and intricate decorations.[41] During the Zhenguan era (627-649 CE) of the Tang Dynasty, the multi-courtyard system with halls as the main structure began to appear, leading to a decline in pagodas.[42] A

[38] Si Si Wang, "The Sinicization of Tibetan Buddhism: The Aesthetic Commonality of Sino-Tibetan Temple Architecture," Journal of Qinghai Minzu University (2023).
[39] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[40] Yuanhe Li, 李元和 "Study on Static Characteristics of Chinese Typical Dougong Wooden Structure," 中国典型斗拱木结构静力学特性研究 PhD diss., Mongolia Agricultural University, 2003.
[41] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[42] Yanqing Gao, "Chinese Buddhist Monastery Architecture Historical Change," Mudanjiang Normal University.

Buddhist hall became the center of the temples, a style adopted by the Song Dynasty and the Ming Dynasty.[43]

Song (920-1279 CE) and Ming (1368-1644 CE) Dynasties

In these later dynasties, Buddhist wooden temples started integrating elaborate carvings, paintings, and symbolic architectural elements. For example, temples during the Song Dynasty featured refined proportions and elegant simplicity, whereas temples during the Ming Dynasty showcased grandeur and intricate decorative elements.[44] Despite these differences, temple architecture was rooted in wooden construction techniques. Some architectural styles were inherited, while other styles were disregarded and eventually replaced by new styles. For example, in the case of the Guanyin Temple, the original temple built during the Southern Song Dynasty was renovated during the Ming and Qing dynasties, and the existing buildings mainly feature the architectural style of the Ming and Qing dynasties.

Physical Characteristics of Wooden Buddhist Temples in China

Buddhist wooden temples are found across China, and although regional differences exist in their architectural style, these temples have some representative architectural characteristics. These characteristics are shaped by the materials used, architectural layout, structural design, and decorative elements. Most Chinese Buddhist temples are built using wood, and this material choice is in alignment with Buddhist values emphasizing harmony between spirit and nature.[45] In

[43] Gao, "Chinese Buddhist Monastery Architecture Historical Change."
[44] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[45] Guan, Xin, and Dan Li. "The Artistic Conception Shaping of Religious Space in Chinese Buddhist Temples." 中国佛教寺庙宗教空间的艺术构思 Shanxi Architecture (2008).

regions where wood is scarce, locally available materials are used in the construction of the temple. However, the focus is always on creating harmony between temple design and the surrounding environment. The layout of the wooden temples is according to the standard Chinese architectural principles, but local influences can also be observed. One of the most exciting aspects of Buddhist wooden temples is the use of traditional construction techniques, such as the method of the mortise and tenon joint.

Construction Materials

The most important characteristic of Buddhist wooden temples is that they are built using wood. Different wood species are found across regions. Ancient architects and artisans used locally available wood to build wooden temples. Since timber is scarce in today's world, restoring these temples can be challenging, as the authenticity of these structures may be compromised if suitable materials are not used. Wood is historically associated with Buddhist temple construction in China due to its availability and the traditional craftsmanship associated with it.[46] It is used to build pedestals, columns, grinders, brackets, roofs, gables, and caissons.[47] However, the choice of construction materials is largely influenced by local resources and the region's environmental conditions.

Most wooden temples are found in southern regions because there are dense forests from which timber can be sourced. The types of wood used for construction have to be durable and resistant to decay. For example, cedar and fir are commonly used in temple construction because

[46] Xin Li.李昕 "Research on Material Properties and Key Techniques of Damage Detection of Ancient Architectural Wood Components," 古代建筑木质构件材料特性和损伤检测关键技术研究 PhD diss., Beijing University of Technology, 2015.
[47] Yinong Huang, "Aesthetic Characteristics of Ancient Chinese Architecture," China Academic Journal Electronic Publishing House.

they produce natural oils that protect against insects and moisture.[48] Wood is also used to create intricate joinery techniques that allow flexibility and stability. The properties of wood change depending on the climatic conditions. In hot weather, it expands, while in cold weather, it contracts, so the structure must be flexible to allow the expansion and contraction of wood.[49] In this way, the temple is able to maintain its structural integrity.

In addition to wood, materials like stone, clay, and metals may be used in temple construction. Ancient artisans and builders used locally available materials in temple construction. Stones are often used to build foundations for wooden structures, clay is used to make roof tiles, and metals may be used to make ornamental features.[50] All these elements, when combined, add to the magnificence of wooden temples. This helps to understand that wooden temples are not entirely made of wood; different materials are used but sparingly. Wood is the most important material of the wooden temple. It can also withstand the impact of seismic activities and natural disasters. In areas that are prone to earthquakes, flexible wooden frameworks are used in temple construction, as they can effectively absorb shocks.[51] The use of wood and stone in ancient construction is based on the concept that the two materials are complementary in nature and can reduce each other's limitations.[52] Therefore, wood has been

[48] Chunrong Hao, 郝春荣 "The Prospect of Chinese Wooden Structure Building from the Development of Chinese and Western Wooden Structure Building." 从中西木结构建筑的发展看中国木结构建筑的前景 Master's Thesis, Tsinghua University, 清华大学硕士论文, 2004.
[49] Xin Li.李昕 "Research on Material Properties and Key Techniques of Damage Detection of Ancient Architectural Wood Components," 古代建筑木质构件材料特性和损伤检测关键技术研究 PhD diss., Beijing University of Technology, 2015.
[50] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[51] Jianguo Zheng, Jian Xu, Chunyu Qian, Qifang Xie, and Long Wang, "Research on Some Key Techniques of Earthquake Resistance and Vibration Control of Ancient Buildings," The Journal of Civil Engineering (2023).
[52] Hua Sun, "A preliminary discussion on the protection of architectural heritage – focusing on the protection and restoration of timber-framed buildings," Journal of the Palace Museum, no. 10 (2024).

used in temple construction for centuries. It can be used to create not only a framework but also joinery systems as well as decorations.

Architectural Layout

The architecture of Buddhist wooden temples combines symbolism to reflect the religious and cultural significance of the structures. Although aesthetics is emphasized, it is not the only goal of the wooden temple architecture; temples are designed to embody the beliefs and values that underpin Buddhism. The architectural layout of Buddhist wooden temples represents various aspects of Buddhist cosmology. As shown in Figure 1.6, the temple is usually organized along a central axis connecting a series of courtyards and halls, which mirrors a journey from the mundane to the sacred; the mountain gate exists at the entrance, and it symbolizes the transition from the earthly realm to spiritual enlightenment.[53] The axis is believed to be the polar axis of the endless cycle of life that also symbolizes the order of the universe.[54] The temple complex consists of various halls dedicated to different deities. This central axis design emphasizes order and harmony, and it not only reflects traditional Chinese architectural principles but also aligns with Buddhist teachings about balance and symmetry.

[53] Gannan Zhu, and Feng Lin, "Analyze the Characteristics of Chinese Temple Structure and Layout," China Academic Journal Electronic Publishing House, (2013).
[54] Xinxin Tong, "The Contradiction and Complexity of Chinese Temple Complexes," Shanxi Architecture 42, no. 23 (2016): 29.

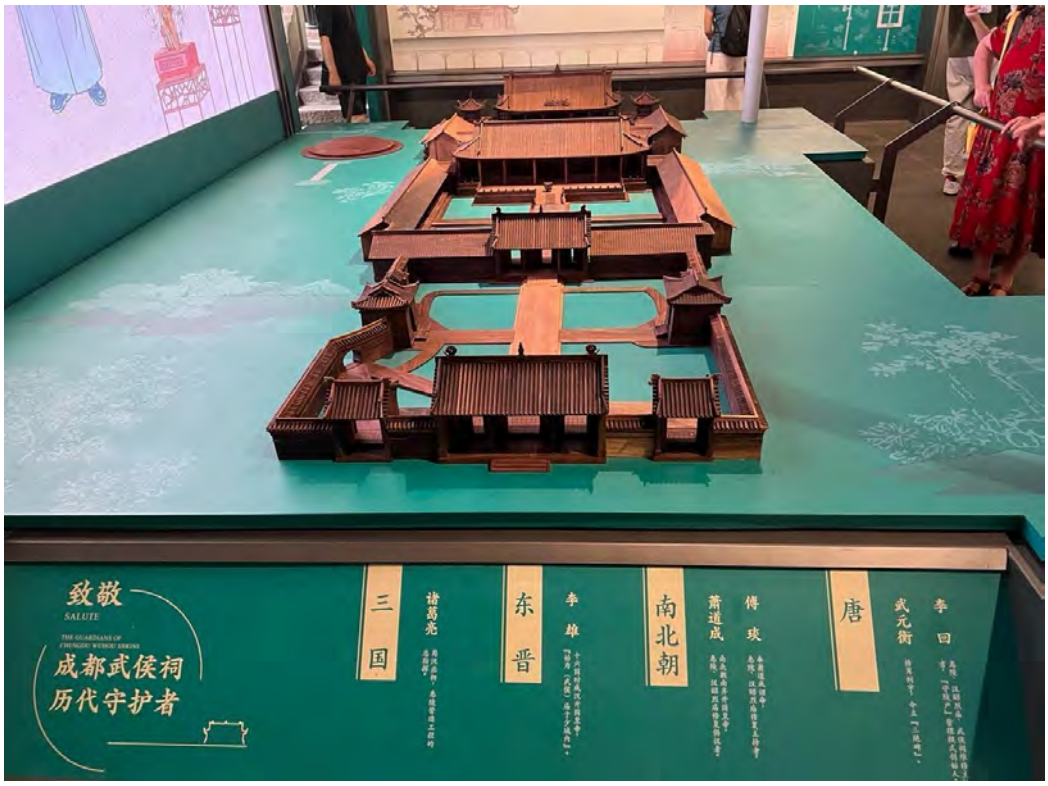

Figure 1.6: Layout of the Wuhou Temple, Chengdu. Photo by Author.

The concept of Feng Shui is used in the construction of temples; it considers the ecological environment, spatial composition, and landscape elements because the emphasis is on integrating nature with the temple and connecting the temple with resources, such as rivers and forests, for sustenance.[55] Therefore, traditional Chinese temples are mostly built near mountains or rivers; this strategic location helps the temple to access resources and sustain itself. The Guanyin Temple is located on Jiulian Mountain, while the Chunyang Temple is located in an urban area surrounded by green spaces.

In Buddhism, maintaining harmony with nature is critical, and it is evident in the construction of wooden temples. Most wooden temples are located in mountainous regions, and

[55] Xinxin Tong, "The Contradiction and Complexity of Chinese Temple Complexes," *Shanxi Architecture* 42, no. 23 (2016): 29.

they feature roofs that mimic the peaks around them; the temples near water bodies tend to incorporate reflective pools or gardens.[56] Wooden temples in the mountains tend to emphasize verticality and strength in their design to resonate with the surrounding peaks, while temples near water bodies focus on fluidity and reflection.[57] This shows that architectural adaptations made to accommodate natural landscapes carry spiritual significance. In this way, Buddhist wooden temples integrate nature into their architectural design, which not only serves aesthetic purposes but also embodies Buddhist teachings.

A typical Buddhist wooden temple includes several halls dedicated to Buddhist deities, buildings for storing relics and scriptures, lecture halls, reception halls, temple gardens, monk rooms, and warehouses.[58] The Main Hall is considered the heart of the temple, and it serves as a focal point of worship, as it enshrines the statue of Buddha.[59] The buildings where sacred texts, scriptures, and relics are stored are often used for communal chanting and study sessions. There may be towering pagodas or bell towers near the entrance, and these buildings mark time for daily rituals and also add to the spiritual ambiance of the temple; the pathways that connect these buildings symbolize spiritual paths leading toward enlightenment.[60]

[56] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[57] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[58] Gannan Zhu, and Feng Lin, "Analyze the Characteristics of Chinese Temple Structure and Layout," China Academic Journal Electronic Publishing House, (2013).
[59] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[60] Gannan Zhu, and Feng Lin, "Analyze the Characteristics of Chinese Temple Structure and Layout," China Academic Journal Electronic Publishing House, (2013).

Structural Design

Traditional structural methods used in Chinese wooden temples include Dougong, an interlocking bracket system that supports larger spans without compromising structural integrity.[61] Another method is the beam-column system. In this method, beams and columns are used to build skeletons for buildings; columns stand on the foundation, while several beams are placed across the top, creating a layered wooden structure.[62]

Yet the pinnacle of ancient Chinese wooden temple structural systems is mortise and tenon joinery, as shown in Figure 1.7, which dates back approximately seven thousand years.

Figure 1.7: Mortise and tenon joints used in ancient wooden temples restoration. Photo by Dan Changrong.

[61] Yinong Huang, "Aesthetic Characteristics of Ancient Chinese Architecture," China Academic Journal Electronic Publishing House.
[62] Mengqian Yang, Yangguang Hao, and Ling Yu, "Analysis on the Innovative Application of Mortise and Tenon Structure in Modern Architecture," China Academic Journal Electronic Publishing House.

This method originated in ancient China during the Shang and Zhou dynasties (1600-221 BCE) and can be considered the soul of Chinese architecture, as it can be observed in almost all ancient buildings, especially those built during the Ming and Qing dynasties.

The mortise and tenon joint consists of two pieces of wood that are designed to fit together, and each piece is meticulously shaped to ensure a perfect fit.[63] It embodies the traditional Chinese philosophy of Yin and Yang: mortise and tenon are convex and concave, so they complement each other.[64] Yet the joints are not tightly connected; there is a gap between them, which adds flexibility to the whole structure. This method withstands both vertical and horizontal forces.[65] The interlocking nature of the joint allows slight movement without compromising the structural integrity of the building, which makes it resilient during earthquakes.[66] Mortise and tenon joints are stronger and more durable than those connected with iron nails.[67] This method has a reasonable structure, provides high joint strength, and can be easily repaired.[68]

In many cases, mortise and tenon joinery is more effective than modern construction methods. Nails, screws, and adhesives can restrict natural movement within the wood, weakening the structure. In addition to structural support, this method also adds to the aesthetics

[63] Mengqian Yang, Yangguang Hao, and Ling Yu, "Analysis on the Innovative Application of Mortise and Tenon Structure in Modern Architecture," China Academic Journal Electronic Publishing House.
[64] Yanru He,何燕如 Qingsong Li, 李青松 and Pai Guan.管培 "Application of Mortise and Tenon Structure from the Perspective of Excellent Traditional Culture Inheritance," 从优秀传统文化的传承视角看榫卯结构的应用 China Academic Journal Electronic Publishing House. 中国学术期刊电子杂志社.
[65] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[66] Jianguo Zheng, Jian Xu, Chunyu Qian, Qifang Xie, and Long Wang, "Research on Some Key Techniques of Earthquake Resistance and Vibration Control of Ancient Buildings," The Journal of Civil Engineering (2023).
[67] Xinyu Bai, "Scientific wisdom in ancient Chinese architecture," China Academic Journal Electronic Publishing House, 2024.
[68] Yanru He,何燕如 Qingsong Li, 李青松 and Pai Guan.管培 "Application of Mortise and Tenon Structure from the Perspective of Excellent Traditional Culture Inheritance," 从优秀传统文化的传承视角看榫卯结构的应用 China Academic Journal Electronic Publishing House. 中国学术期刊电子杂志社.

of the wooden temples. As wooden components are seamlessly integrated, there is a visually pleasing cohesiveness, highlighting the natural beauty of the material. The issue is that this method is not widely used in modern China, and there is a growing concern about the potential loss of this traditional technique. It also creates issues for the restoration of ancient wooden temples. However, this method is no longer common as the wooden frame system is gradually replaced by reinforced cement.[69] It is difficult to find artisans who are skilled in this method, leading to a growing concern about the potential loss of this traditional technique.

Decorative Elements

Buddhist wooden temples are renowned for their intricate carvings, paintings, and elaborate decorative elements. These decorative features enhance the aesthetic appeal of the temple and also convey profound spiritual messages. They are not merely decorations; they reflect the beliefs, narratives, and traditions of the region. One of the main decorative elements of wooden temples is wood carving. In wooden temples, structural components, such as eaves, beams, pillars, and doors, are embellished with intricate carvings, which include depictions of Buddhist narratives and representations of dragons, phoenixes, and other elements from Buddhist iconography, as shown in Figure 1.8.[70] These carvings tell a story central to Buddhist teachings. For example, dragons are seen as protectors, while phoenixes are associated with rebirth; the lotus flower is a recurring theme in Buddhist art, and it symbolizes purity.[71] These motifs are integrated into the temple design as decorative elements.

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[69] Yefan Wu, "Mortise and tenon: Wisdom is hidden between the concave and convex," China Academic Journal Electronic Publishing House (2024).
[70] Jiexing Li, "The Layout and Decorative Art of Traditional Chinese Buddhist Temple Architecture," China Academic Journal Electronic Publishing House.
[71] Bei Wu, "The Artistic Features of Putuo Mountain Temple Architecture," *Journal of Luohe Vocational Technology College* 8 (2009).

Figure 1.8: Temple roof decoration at Mount Qingcheng. Photo by Author.

Similar to wood carvings, paintings also contribute to temple adornment. The walls and ceilings of wooden temples are often covered with paintings that depict scenes from Buddha's life or illustrate important Buddhist teachings. The main themes in Buddhist paintings are Buddha, Bodhisattvas, guardians, and celestial beings.[72] Colors that carry specific meanings within Buddhism are used in those paintings. For example, gold is used to symbolize divinity, while red represents good fortune.[73] The roof decorated with gold exudes brilliance and creates a sense of richness and luxury.[74] Wooden temples in northern regions use warm colors for temple

[72] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[73] Weimin Qi, and Yue Zhao, "A Brief Analysis of the Architectural Color of Buddhist Temples in Northeast China," 中国东北地区佛教寺庙建筑色彩简析 Zhuzhu Technology.
[74] Yinong Huang, "Aesthetic Characteristics of Ancient Chinese Architecture," China Academic Journal Electronic Publishing House.

decoration, while those in southern regions tend to have gray tones.[75] The artistic techniques used to create those paintings can vary depending on the region and historical period. Some temples feature frescoes, while others include tempera paintings. These decorations not only beautify the temples but also serve as educational tools. Visitors who are not familiar with Buddhist texts or cannot read can learn about Buddhism from the paintings. The visual storytelling found in the decorative elements of the temple is essential for imparting religious wisdom.

Figure 1.9: Outdoor design of Chunyang Guan Temple combines Daoism and Buddhism. Photo by Author.

[75] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.

Buddhist temples are unique because their architectural legacy is deeply intertwined with Confucianism and Daoism. While Confucianism shaped the moral and social frameworks of Chinese society, Daoism contributed to philosophical thought, and Buddhism supported spiritual and artistic development.[76] Due to the interplay between these three religions, a unique expression in architecture and culture developed. For example, the architectural design of the Chunyang Guan Temple, as shown in Figure 1.9, incorporates religious elements of all three religions in its interior and exterior decoration. There are a large number of statues of Confucian figures in the Dazhong Pavilion and Zhixiao Pavilion, and there are also statues of figures from Buddhism and Daoism in the temple; all three religions coexist in harmony in the temple.

Religious Differences

Although the majority of wooden temples are in Southwest China, they can be found in other regions as well. Buddhist temple construction in China showcases a rich tapestry of architectural styles shaped by regional climate, geography, and culture. Significant regional differences in the architectural landscape of Chinese wooden temples arise from local climatic conditions, geographical features, and cultural influences.[77] While southern wooden temples tend to have expansive layouts emphasizing ventilation due to humid climates, northern wooden temples focus on compactness and symmetry to deal with harsh climates.[78] The differences in northern and southern temple architecture are not just structural; they also reflect broader cultural narratives and religious practices. Southern temples emphasize harmony with nature, while

[76] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[77] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[78] Liang, 梁思成 and Lin 林徽因, History of Chinese Architecture.

northern temples focus more on grandeur and monumentalism.[79] These regional variations give rise to unique architectural characteristics and aesthetic principles in wooden temple design.

Northern China

Wooden temples in Northern China have robust and functional designs to deal with harsh climatic conditions.[80] They tend to have austere designs, featuring straight-lined gabled roofs with a more rectilinear and squared-off design; these roofs are steeply pitched to help with snow drainage.[81] Glazed tiles are used in the roof, which signifies prestige. These temples tend to be less sprawling than their southern counterparts. Their more compact layout has a single courtyard or single-hall structures, conveying a sense of solemnity.[82] The primary materials used in the construction of northern temples are brick and stone, and wood is used sparingly in comparison to southern temples.[83] They have thicker walls than in the south for better insulation against cold; the emphasis is on simplicity and durability rather than ornate detailing, as shown in Figure 1.10. These temples lack intricate carvings but often feature geometric patterns, and some temples incorporate paintings that reflect local artistic traditions.

Northern temples reflect a fusion of architectural styles. These temples include elements of both Chinese and Tibetan Buddhism and also maintain Central Plains influences.[84] One of the prominent examples of a northern temple is the Ci'en Temple. It is located in Shenyang and was built in 1672 CE during the Qing Dynasty; it features magnificent halls dedicated to Buddha and

[79] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[80] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[81] Liang, 梁思成 and Lin 林徽因, History of Chinese Architecture.
[82] Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China."
[83] Liang, 梁思成 and Lin 林徽因, History of Chinese Architecture.
[84] Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China."

Bodhisattvas. Its most important feature is the thirteen-story, octagonal White Pagoda, making the temple a key landmark of the city.[85] The Ci'en Temple was rebuilt in 1900, and its restoration was completed in 1919.[86] Another notable example is the Taiqing Palace. It is also located in Shenyang and was built in 1663 CE; it consists of 100 rooms.[87] It is one of the most important Daoist temples in China.

Figure 1.10: Layout of Shenyang Taicheng Palace (example of northern temple). Image source: Xuan Duguang.

Southern China

Wooden temples in Southern temples generally feature intricate designs and use lighter materials. They are known for their multi-eaved roofs, curved ridges, and intricate structures.

[85] "Da Ci'en Temple." Travel China Guide, accessed October 15, 2024, https://www.travelchinaguide.com/attraction/shaanxi/xian/da-ci-en-temple.htm
[86] Yue Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China," 东北地区寺庙建筑室内装饰设计研究 Master's Thesis, Ilin Jianzhu University, 2019.
[87] "Taiqing Palace: Another Qing Dynasty palace in Shenyang," China Daily, updated December 3, 2013, https://www.chinadaily.com.cn/travel/2013-12/03/content_17148147.htm

Overhanging eaves and curved hard gable roofs are helpful in shedding rainwater, which is an issue in the humid climate of southern China.[88] These temples have multiple courtyards with a sequence of halls and open spaces, which helps with ventilation and moisture resistance. Wood is extensively used in the construction of southern temples; elaborately carved beams and columns are created out of wood, and sophisticated construction techniques such as Dougong are used to provide structural support.[89] Unlike northern temples, southern temples emphasize vibrant murals, wood carvings, and stone sculptures. They often depict Buddhist stories, reflecting the cultural heritage of the region. Clay tiles are used in the roof of these temples, and they blend naturally with the surrounding environment.[90] These tiles are susceptible to moss growth in the humid climate.

The architecture of southern temples incorporates Chinese Buddhist elements. These temples are elevated above ground level and are designed in a way that they seamlessly blend with nature, emphasizing harmony between humankind and nature.[91] Southern temples embody grace and intricate artistry suitable for milder climatic conditions. They have a central axis layout that emphasizes symmetry and balance, which are crucial in traditional Chinese architecture. Wood is used to create not only a framework but also elaborate decorative features, such as eaves and carvings depicting Buddhist iconography.

Important examples of southern temples include the Baiyun Temple and the Wenshu Monastery. As shown in Figure 1.11, the Baiyun Temple is located in Xinjin and was built in

[88] Zhao, "Research on Interior Decoration Design of Temple Architecture in Northeast China."
[89] Yuanhe Li, 李元和 "Study on Static Characteristics of Chinese Typical Dougong Wooden Structure," 中国典型斗拱木结构静力学特性研究 PhD diss., Mongolia Agricultural University, 2003.
[90] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[91] Gannan Zhu, and Feng Lin, "Analyze the Characteristics of Chinese Temple Structure and Layout," China Academic Journal Electronic Publishing House, (2013).

1371 CE during the Ming Dynasty; it covers a total area of Seventy-two acres and is surrounded by mountains and water bodies.[92] Like most Chinese Buddhist temples, it includes several halls and buildings dedicated to different deities. As shown in Figure 1.12, the Wenshu Monastery is located in Chengdu and was built during the Sui and Tang Dynasties (518-907 CE); it is one of the oldest Buddhist temples in Chengdu, and because of repair and expansions, the current structure showcases the architectural styles of the Ming and Qing Dynasties (1368-1912 CE).[93] Since these temples were built centuries ago and were impacted by wars and natural disasters, they underwent repairs and renovations over time, so it is common to observe the overlapping of architectural styles from different dynasties. These temples stand as testaments to the diverse cultural landscape of China.

[92] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局“Xinjin Baiyun Temple,”新津白云寺.
[93] Tianyu Lei, “The Trajectory of Revival: Wenshu Monastery 1978–2006,” Religions 12, No. 1 (2021).

Figure 1.11: Xinjin Baiyun Temple. Photo by Author.

Figure 1.12: Wenshu Monastery, Chengdu. Photo by Author.

Integration of Religion and Architecture

Religion cannot be separated from temple architecture. The traditional layout of temples, especially Buddhist temples, is designed in accordance with the concept of balance and harmony; the temple buildings are built to house important deities and their walls are decorated to tell stories of those deities and important religious figures.[94] The architecture of the Chunyang Guan

[94] Wanwin Zhao, and Yunyun Mao, "Reflections on Conservation and Restoration of Local Temple Buildings and Groups of Buildings–Taking Liangping Shuanggui Tang in Chongqing as an example," Huazhong Architecture (2009): 136.

Temple is heavily influenced by not only Buddhism but also Confucianism and Daoism; the temple has a large number of statues of figures from all three religions, and there are exquisite images depicting legends and stories related to the three religions.[95] Although the temple is no longer a place of worship, its architecture reflects its deep association with religion.

The buildings of ancient temples are built for specific religious purposes. For example, in Daoist temples, priests tend to perform daily rituals in front of the main hall, and they offer counseling services in other buildings.[96] In the case of Buddhist temples, their architecture integrates values, philosophy, beliefs, and customs related to Buddhism. These temples provide spiritual and cultural resources for the public and perform their social functions, such as spiritual purification, charity, public welfare, and cultural tourism.[97] Temples provide a space for people to practice their religion, and every other activity is more or less associated with religion. Temple tourism may downplay the role of religion in temple architecture to attract more non-religious visitors, but it cannot deny the importance of religion in temple architecture.

Monks and priests have played an important role in temple restoration in the past. They encouraged the local community to engage in temple restoration. For example, in the case of Guanyin Temple, the deteriorated temple after the war during the Southern Song Dynasty was not renovated until the monks during the Ming Dynasty started the repair process; those monks rebuilt the destroyed temples.[98] Without the involvement of these monks, the Guanyin Temple

[95] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[96] Jingwen Liang, Horos Chen, and Ruigang Chen, "Folk Temples and China's Religious Economy–Religious Managers Explore," (2010): 25.
[97] Kai Sheng, "The Relationship and Boundary between Chinese Buddhist Culture and Chinese Excellent Traditional Culture," Anthology and Introduction of Buddhist Time Concept Literature, 2023.
[98] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple,"观音寺的历史与壁画.

would not have survived. They rebuilt the temple because of its religious significance. Temple architecture can be considered a physical manifestation of religious beliefs.

When these ancient temples are protected, the religious and cultural heritage that they represent is also protected. One of the reasons why religions are able to survive and maintain their significance is the existence of temples. When temples survive, religion also survives. There are a large number of Buddhist temples all over China, which shows how significant Buddhism is in China. When temples disappear, religions may also disappear, as people will not have space or guidance to practice their religion. Protecting ancient temples is the same as protecting ancient religions. If there is no religion, there will not be temples. They will be converted into buildings for other purposes. For example, the Chunyang Guan Temple was turned into a museum. Hence, religion and temple architecture are inseparable and should be seen as the two sides of the same coin.

Chapter 2: Conservation Challenges and Strategies for China's Wooden Temples

While traditional wooden architecture is strong and resilient, the ancient wooden temples of China face a range of conservation challenges, from environmental elements to a decline in religious practice. Principles and strategies exist to address structural challenges; the social challenges require new and different approaches.

Challenges

Environmental Elements

Environmental elements of different topographies, such as moisture, humidity, and temperature, can be detrimental to historic wooden temples that are constructed using wood or timber, as shown in Figure 2.1. They can interact with timber and cause negative changes to the structural integrity of those wooden structures. As a result, their long-term durability will be impacted. Understanding and analyzing how timber is affected by various environmental elements is an important part of the conservation of historic wooden structures.

Moisture can cause significant damage to structures that are made from timber. It is harmful for timber structures because when it is absorbed by the wood, there is expansion, and where the wood dries, there occurs contraction, which gives rise to a cycle of expansion and contraction, leading to cracking, splitting, and warping.[99] It significantly compromises the overall framework of the structure and compromises its integrity. Another moisture-related issue

[99] J. Y., R. Wang, Stirling, Paul I. Morris, A. Taylor, J. Lloyed, G. Kirker, S. Lebow, and M. E. Mankowski, "Durability of mass timber structures: A review of the biological risks," *Wood and Fiber Science* 50, (2018).

is that if the wood is exposed to moisture for several months, it will be severely deteriorated because natural fibers in the wood end up breaking down when consistently wet.[100] This issue is particularly common in regions where there is high humidity or frequent rainfall, as the wood does not get sufficient time to dry out between wet periods.

Wood decay is also caused by moisture. It takes place because moisture facilitates the growth of fungi, as shown in Figure 2.2. Fungal infestation can lead to significant damage to wooden structures over time by weakening them, leading to cracking and splitting. Especially in shaded or poorly ventilated areas of wooden structures, it can take a lot of time for the wood to dry out, creating an ideal environment for fungal spores to germinate and grow.[101] In other words, where there is consistent moisture, there is a high probability of fungal infestation. The stability and safety of wooden structures are threatened by this biological deterioration.

[100] Peter Brimblecombe, and Jenny Richards, "Moisture as a driver of long-term threats to timber heritage—part II: risks imposed on structures at local sites," Heritage 5, No. 4 (2022).
[101] Jagjit Singh, "Fungal problems in historic buildings," *Journal of Architectural Conservation* 6, No. 1 (2000).

Figure 2.1: Damage in Chunyang Guan caused by environmental factors. Photo by Author.

Another environmental factor that can adversely impact the health of timber is humidity, which is different from moisture. Humidity relates to vapor content of a material, while moisture relates to water content. Yet they are closely related. The change in the levels of humidity is directly proportional to the moisture content in the wood; in other words, when there is high humidity in the air, there is high moisture content in the wood, which can exacerbate issues related to moisture absorption.[102] Also, changes in humidity levels can cause expansion and contraction, leading to dimensional changes in wood that can affect joints and connections within

[102] Jenny Richards, and Peter Brimblecombe, "Moisture as a Driver of Long-Term Threats to Timber Heritage–Part I: Changing Heritage Climatology," *Heritage* 5, No. 3(2022).

the wooden structures.[103] Wooden temples in regions with fluctuating humidity levels are likely to experience stress at the joints, which can ultimately lead to structural failures.[104]

Figure 2.2: Wood decay in Chunyang Guan. Photo by Dan Changrong.

Similarly, low humidity will cause wood to lose its moisture and dry out excessively, which can lead to shrinkage and cracking.[105] When wood is excessively dry, its dimensions are reduced. It means that low humidity levels are detrimental to wooden structures. There needs to be a balanced humidity level in order to maintain the structural integrity of those structures. Humidity does not directly affect wood; it affects moisture, which, in turn, damages wood.

Temperature is also a critical environmental element that influences the condition of timber in wooden temples. High temperature accelerates the drying process of wood by causing

[103] Richards and Brimblecombe, "Moisture as a Driver of Long-Term Threats to Timber Heritage–Part I: Changing Heritage Climatology."
[104] Junhong Huan, Donghui Ma, and Wei Wang, "Vulnerability analysis of ancient timber architecture by considering the correlation of different failure modes," *Mathematical Problems in Engineering* 1, (2018).
[105] Jenny Richards, and Peter Brimblecombe, "Moisture as a Driver of Long-Term Threats to Timber Heritage–Part I: Changing Heritage Climatology," *Heritage* 5, No. 3(2022).

rapid moisture loss.[106] When humidity and temperature interact, it creates a compound effect; the evaporation rate is increased by high temperature, and the wood dries out rapidly. When there are extreme fluctuations in temperature, wood can experience thermal expansion and contraction, which can further worsen the mechanical stresses that are already imposed by moisture changes.[107]

The rate of biological deterioration is also affected by temperature. Fungi and insects thrive in a warmer temperature because it increases their metabolic rate, which accelerates rates of decay and infestation; therefore, biological risks such as insect attacks are very common in warmer climates.[108] The longevity of timber structures is threatened in extremely hot climates .

Moisture, humidity, and temperature do not affect wooden structures separately. Their effects are intertwined, which gives rise to a complex and challenging environment for wooden structures. There is an increased risk of fungal growth and insect infestation in places where there are high humidity levels and high temperatures.[109] Since many traditional wooden structures in China are located in regions with fluctuating temperatures and humidity levels, they are prone to biological deterioration due to the combined impact of moisture, humidity, and temperature.[110] These wooden structures are likely to experience accelerated deterioration due to the combination of those environmental elements.

The location of historic wooden structures plays a crucial role in influencing the interaction between moisture, humidity, and temperature. Shaded areas have low temperature, so

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[106] S. Mindess, "Environmental deterioration of timber," *WIT Transactions on State of the Art in Science and Engineering* 28, (2007).
[107] Mindess, "Environmental deterioration of timber."
[108] J. Y., R. Wang, Stirling, Paul I. Morris, A. Taylor, J. Lloyed, G. Kirker, S. Lebow, and M. E. Mankowski, "Durability of mass timber structures: A review of the biological risks," *Wood and Fiber Science* 50, (2018).
[109] S. Mindess, "Environmental deterioration of timber," *WIT Transactions on State of the Art in Science and Engineering* 28, (2007).
[110] Ze-li Que, Zhe-rui Li, Xiao-lan Zhang, Zi-ye Yuan, and Biao Pan, "Traditional wooden buildings in China," *Wood in Civil Engineering*, (2017).

temples located there are more likely to retain moisture, whereas open areas get direct sunlight, so temples located there will experience rapid drying.[111] Temples in shaded areas often suffer greater environmental damage than temples in open areas because moisture can be more damaging than drying. As shown in Figure 2.3, wooden structures are subjected to uneven wear and stress over time due to this variability, and it increases the probability of significant damage in the future.

Historic wooden temples are vulnerable to severe damage caused by moisture, humidity, and temperature. Some of the critical problems caused by these environmental elements include rotting, insect infestation, fungal growth, water seepage, cracking, and peeling. It is necessary to understand and study these effects to find proper ways to mitigate them and conserve historical wooden structures.

A common form of damage that can occur in historical timber structures is rotting. It is primarily caused by prolonged exposure to moisture. Wood that remains damp for extended periods becomes susceptible to fungal attack; fungi break down the cellular structure of the wood. There are different kinds of fungi that cause rotting, such as brown rot and white rot fungi; brown rot fungi are mostly found in tropical climates, whereas white rot fungi are found in temperate climates.[112] Rotting is also referred to as decay. The decay process weakens the wood, which lessens the stability and safety of the overall structure.[113] Hence, rotting can lead to severe structural damage in the long term.

[111] Jagjit Singh, "Fungal problems in historic buildings," *Journal of Architectural Conservation* 6, No. 1 (2000).
[112] Jenny Richards, and Peter Brimblecombe, "Moisture as a Driver of Long-Term Threats to Timber Heritage–Part I: Changing Heritage Climatology," *Heritage* 5, No. 3(2022).
[113] Peter Brimblecombe, and Jenny Richards, "Moisture as a driver of long-term threats to timber heritage—part II: risks imposed on structures at local sites," Heritage 5, No. 4 (2022).

Figure 2.3: Component decay and cracking in Chunyang Guan. Photo by Dan Changrong.

Insects can also cause severe damage to timber structures. Wood-boring beetles and termites are major threats to wooden structures. These insects are attracted to damp wood because it provides an ideal environment for their life cycles. There are two groups of these insects: wood-digesting and wood-using; wood-digesting insects, such as termites, use wood as food, whereas wood-using insects, such as carpenter ants, do not eat but excavate wood to use it as a substrate.[114] Since these insects prefer humid conditions, high levels of moisture increase insect activity, and they infest wooden structures as they tunnel through the wood and weaken its

[114] J. Y., R. Wang, Stirling, Paul I. Morris, A. Taylor, J. Lloyed, G. Kirker, S. Lebow, and M. E. Mankowski, "Durability of mass timber structures: A review of the biological risks," *Wood and Fiber Science* 50, (2018).

integrity.[115] If insect infestation is left unchecked, wooden structures will potentially collapse due to increased insect activity.

Fungal growth is another major concern for historic timber structures. Fungi need moisture to grow, so they prefer an environment with high humidity levels for their proliferation.[116] Wood decay is the result of fungal growth, and it can be difficult to detect until substantial damage has occurred. Fungal growth is detrimental to not only the wood but also the occupants of the wooden structures as the release of spores and mycotoxins can cause health risks.[117]

Due to cracks, inadequate waterproofing, or poor drainage, rain water can enter the structure, leading to an increase in moisture. When moisture penetrates walls and important structural elements of a wooden structure, it causes water seepage; as a result, damp patches can occur on walls, which further exacerbates issues such as peeling and mold and can cause disintegration of the structure.[118] This occurs because of ineffective construction and irregular maintenance of wooden structures. If left unchecked, water seepage can severely weaken the structural integrity of the structure and lead to more critical issues such as the failure of the whole framework.

Cracking also accelerates the deterioration process. It occurs when there are temperature fluctuations in the wood; wood expands and contracts due to changes in temperature, which leads to the formation of cracks that allow moisture to enter the structure.[119] This cycle of

[115] S. Mindess, "Environmental deterioration of timber," *WIT Transactions on State of the Art in Science and Engineering* 28, (2007).
[116] Jagjit Singh, "Fungal problems in historic buildings," *Journal of Architectural Conservation* 6, No. 1 (2000).
[117] Singh, "Fungal problems in historic buildings."
[118] Jenny Richards, and Peter Brimblecombe, "Moisture as a Driver of Long-Term Threats to Timber Heritage–Part I: Changing Heritage Climatology," *Heritage* 5, No. 3(2022).
[119] S. Mindess, "Environmental deterioration of timber," *WIT Transactions on State of the Art in Science and Engineering* 28, (2007).

damage can be difficult to control. Cracking not only lowers the aesthetic value of the structure but also allows moisture and pests to enter and do more damage.

Another visible sign of damage caused by moisture in wooden temples is peeling. When wood absorbs moisture, paint and other finishes lose adhesion, which results in peeling. It can negatively impact the appearance of the temple. Moreover, it can expose the underlying wood to more moisture, which can increase the risk of rotting. Maintaining the exterior finish of wooden structures is essential to protecting them from environmental deterioration.[120] Although peeling is considered minor damage, it needs to be addressed to avoid potential greater damage.

The damage caused by moisture, humidity, and temperature can be extremely detrimental to wooden temples. These environmental elements work together to create an unfavorable environment that supports rotting, insect infestation, fungal growth, water seepage, cracking, and peeling. These types of damage are a major threat to the structural integrity of wooden temples. They also make it difficult for conservationists to engage in conservation and restoration because higher levels of damages make it more difficult to repair and restore the structure. In order to effectively protect and conserve historic timber structures, conservationists have developed effective strategies aimed at mitigating those damages, but they need to ensure that those strategies do not hinder the overall conservation process.

Climate Change

Changing climate patterns have exacerbated these issues. Increased humidity, temperature shifts, and more frequent natural disasters like floods and storms threaten the long-

[120] Peter Brimblecombe, and Jenny Richards, "Moisture as a driver of long-term threats to timber heritage—part II: risks imposed on structures at local sites," Heritage 5, No. 4 (2022).

term stability of wooden temples. In this context, modern preservation techniques must adapt to these emerging threats.

Climate change threatens cultural heritage, especially wooden temples, which are more vulnerable in the face of changing climatic conditions. The relations between climate dynamics and preservation of cultural heritage are of extreme importance; while environmental forces have always posed a challenge for cultural heritage, the present climate crisis only serves to aggravate the conditions of vulnerability and inequities associated with preservation efforts.[121]

These changing weather patterns have brought many issues for wooden temples, including the increased need for roof drainage, humidity, and rainfall, problems that lead to minor structural issues like roof leaks, wall cracks, and unsteady foundation conditions. Moisture has always been an issue. It accelerates the decaying rate of wooden components, encouraging the growth of mold and creating a breeding ground for pests such as woodworms and carpenter bees, doing severe damage to the centuries-old temples.[122]

Climate change gives rise to extreme weather events that include increased rains and temperatures. The Mogao Caves in Gansu Province have experienced terribly extreme rainfalls leading to flash flooding, which has directly damaged both the infrastructure and the cultural relics that lie within; this increased humidity has led to rapid deterioration of the artworks such as the frescoes.[123] Similarly, during such extreme conditions, wooden temples are also subject to similar risks associated with the sudden change in temperature causing cracking of painted surfaces and distorting the finish. For example, wooden temples, such as the Yingxian Wooden

[121] A. R. Siders and Marcy Rockman, "Connecting Cultural Heritage and Urban Climate Change Adaptation," in *Preservation, Sustainability, and Equity*, ed. Erica Avrami (Columbia Books on Architecture and the City, 2021).
[122] Peter Brimblecombe, and Jenny Richards, "Moisture as a driver of long-term threats to timber heritage—part II: risks imposed on structures at local sites," Heritage 5, No. 4 (2022).
[123] Kresentia Madina, "In China, the Mogao Caves Suffer the Impacts of Climate Change," *Green Network*, July 24, 2023, https://greennetwork.asia/news/in-china-the-mogao-caves-suffer-the-impacts-of-climate-change/

Pagoda in Shanxi Province, are under severe threats from increased rainfall and humidity; these conditions have led to structural challenges like roof leaks, cracks in the wall, and instability of the foundation.[124]

Ancient builders designed wooden structures in China with consideration of the local climate influences necessitating an adaptation to cope with those normal ranges of environmental stress. For instance, roofs have slopes diversely angled based on local conditions of average rainfall so that standing water can drain easily.[125] However, new challenges caused by climate change require forced adaptations that do not truly align with traditional practices.

Scarcity of Resources and Loss of Traditional Techniques

In China, the goal of restoration is to return a structure's original design and form using original or compatible materials and applying traditional skills and methods. A lack of appropriate resources and/or skilled artisans can impair conservation efforts to maintain the authenticity of these temples. Restoration of ancient temples can be difficult depending on the extent of damage, but the guiding principles state that the safety of the structure should be prioritized and that repair should be conducted using original materials and techniques as much as possible so that these structures can be restored to their original form.[126] If original materials and techniques are not used during repair, there can be a risk of greater damage to the structure.

Most ancient Buddhist temples were constructed using timber. Since timber has grown scarce, it is recommended that timber be substituted with a compatible manufactured material.

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[124] Siyang Li, Ke Ding, Aijun Ding, Lejun He, Xin Huang, Quansheng Ge, and Congbin Fu, "Climate change adaption in Chinese ancient architecture," arXiv (2020), https://doi.org/10.48550/arXiv.2012.14244.
[125] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[126] Wanwin Zhao, and Yunyun Mao, "Reflections on Conservation and Restoration of Local Temple Buildings and Groups of Buildings–Taking Liangping Shuanggui Tang in Chongqing as an example," Huazhong Architecture (2009): 138.

Some of these materials include bamboo, recycled wood, composite materials, and plasterboard. Bamboo is a good substitute for traditional building materials. It is light, strong, durable and resistant to wear and water damage. It can withstand very high bending and impact stresses, making them excellent for both building structures and interior decoration. The reused wood can be used for restoration and construction in ancient buildings in place of traditional wood, with the result of reduced consumption of raw timber resources and the resultant environmental impact. Composite materials are a new type of material made from two or more different materials. They are lightweight, strong, corrosion-resistant, waterproof and wear-resistant. They are widely used in constructing floors, wall panels, and wind-and-railing work in the construction industry.

The properties of the new material must align with those of timber so that expansion and contraction due to environmental stressors will not cause any major issues.[127] Since safety is the top priority in the restoration of ancient temples, emphasis should be placed on the selection of appropriate materials. The best option is to use locally sourced materials because ancient architects were most likely to use local materials to build and repair temples. For example, in the restoration of the Chunyang Guan Temple, damaged and decayed wooden components were replaced with those made of compatible materials like bamboo or composite materials to maintain cohesiveness and flexibility in the overall structure.

It is not just enough to use appropriate materials to restore ancient temples; in China, modern conservationists must also use traditional skills and methods. Ancient temples that exist today were built using traditional methods, which means that those methods are extremely

[127] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.

effective, and they should be applied to repair these temples. Ancient wooden structures were constructed using traditional methods, and those methods are being replaced by modern methods in modern society. It is important to raise public awareness about the importance of traditional building methods so that they can be taught to future generations. The mortise and tenon joinery used to build ancient temples provided strength as well as flexibility.[128] This method has become rare in modern society, as Western construction methods are widely used to accelerate the construction process. As a result, it can be difficult to find artisans who are skilled in traditional construction methods, which can cause problems for restoration. For example, the framework created using the mortise and tenon method cannot be repaired using modern fasteners, as it will lower the flexibility of the structure. Therefore, it is necessary to revive these traditional methods. Ancient temples require regular repair to ensure their long-term survival, and without traditional methods, their survival is at risk.

Decline in Religious Practice

A critical issue that directly impacts the conservation of ancient temples is the loss of public interest in religion. Chinese wooden temples are the realistic expression of ancient Chinese philosophical thoughts; they are the spiritual pillar and emotional sustenance of a settlement, a region, or a city.[129] In the past, they used to be places where people went to not only worship but also engage with each other as a community. As modernization and urbanization tightened their grip on Chinese society, people distancing themselves from ancient temples

[128] Xinyu Bai, "Scientific wisdom in ancient Chinese architecture," China Academic Journal Electronic Publishing House, 2024.
[129] Xin Li.李昕 "Research on Material Properties and Key Techniques of Damage Detection of Ancient Architectural Wood Components," 古代建筑木质构件材料特性和损伤检测关键技术研究 PhD diss., Beijing University of Technology, 2015.

created problems for their restoration. A decline in religious practices can lead to people caring less about the conservation of ancient temples.

According to the Pew Research Center, the number of Chinese people attending religious activities dropped from 53% in 2012 to 35% in 2021, and older people are more likely to engage in religious activities than young people.[130] Since fewer people are visiting temples and religious sites, there is a decline in public engagement and financial support, challenging the conservation of those sites.

Due to rapid modernization in China,cities and real estate developers are focusing more on development opportunities than conserving cultural values and traditions.[131] Western cultural ideas have penetrated urban areas in China, as people now tend to emphasize usefulness and efficiency over harmony and community, and material culture has taken over spiritual culture.[132] As a result, people in modern society, especially younger generations, may not see religion as something beneficial to them. Many young people tend to prioritize modern lifestyles and ignore traditional and religious practices.[133] Ancient temples are vital historical structures with centuries of cultural heritage and craftsmanship, but modern people may fail to understand their importance. The temples once considered integral to people's lives have lost much of their original identity, now seen as relics as thinking has changed due to shifts in social values.

[130] "Religious change in China," *Pew Research Center*, effective August 30, 2023, https://www.pewresearch.org/religion/2023/08/30/religious-change-in-china/.
[131] Yingnan Liu,"Research on the Interpretation System of Chinese Architectural Heritage Culture–Constructing a New Development Path of Urban Cultural System," China Central Academy of Fine Arts, 2020.
[132] Liu,"Research on the Interpretation System of Chinese Architectural Heritage Culture–Constructing a New Development Path of Urban Cultural System."
[133] "Religious change in China," *Pew Research Center*.

Guiding Principles of Conservation and Maintenance in China

Not changing the original state

Conservation and maintenance of historical timber structures must align with the guiding principles that are laid out by the Chinese government. One of the main principles used in conservation of Chinese heritage is not changing the original state. It is fundamental in the conservation of historic structures. It emphasizes the importance of maintaining the authenticity and integrity of historical structures. This principle is rooted in the idea that significant change or modification to the original state can diminish the architectural, cultural, and historical significance of the structure.[134]

The reason much emphasis was put on maintaining the original appearance is the Chinese view of the relationship between architecture and culture. The Chinese believe that architecture is the vessel of culture, and buildings are designed under the influence of social conditions and the environment.[135] Modifying the original appearance of ancient buildings is the same as erasing the past culture and traditions, which defeats the whole purpose of conserving ancient cultural sites. Chinese conservationists usually implement the protection policy called "protection first, rescue first, rational use, strength management," and the conservation approach is based on the findings of the comprehensive survey study of the site.[136] The selection of conservation methods and strategies depends on the condition of the building and the environment of the site.

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[134] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[135] Guangzu Yu, "Inheritance and Development of Architectural Culture–taking the Great Auditorium of Henan University as an Example," 建筑文化的传承与发展—以河南大学大礼堂为例, China Academic Journal Electronic Publishing House, (2019).
[136] Changrong Dan, 但昌荣 and Yan Bin 颜斌 . "Analysis of Temple Building Repair Technology in Southwest Area–Taking the Renovation Project of Dazhe Pavillion, a National Treasure Unit in Dazu District of Chongqing as an Example." 西南地区庙观建筑修缮工艺探析—以重庆市大足区国宝单位大悲阁修缮工程为例.

The original state of a historical structure is its authentic condition at the time of its construction or during significant historical periods.[137] The conservation of historical structures must emphasize the conservation of their original forms, materials, and craftsmanship; this principle asserts that the goal of conservation should be to reflect the historical context of the structure without imposing contemporary aesthetics or values because they could distort the original character of the structure.[138]

There are dual interpretations of authenticity in cultural heritage conservation in China; one focuses on restoring the structure to its original state, while another emphasizes conserving its current form, which may include various stages of its historical evolution.[139] Between these two interpretations, the principle of not changing the original state aligns more closely with the first interpretation, as it advocates for a conservation approach that reflects the authentic identity of the structure.

Another reason authenticity is crucial is that it is associated with the cultural heritage of timber structures. The conservation of authenticity honors the craftsmanship and historical context of the structure and fosters a sense of identity and continuity within communities.[140] When a structure is altered significantly, it faces the risk of losing its historical narrative, leading to a disconnection from the cultural memory of the community that it represents.

When the original state of the structure is preserved, it teaches new generations and visitors about the value of heritage; they can gain insights into historical construction, materials,

[137] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[138] ICOMOS China, "Principles for the Conservation of Heritage Sites in China."
[139] Yujie Zhu, "Authenticity and heritage conservation in China: Translation, interpretation, practices," In Authenticity in Architectural Heritage Conservation, Transcultural Research – Heidelberg Studies on Asia and Europe in a Global Context, ed. K. Weiber and N. Gutschow (Springer International, 2017).
[140] Lisa Bixenstine Safford, "Cultural Heritage Preservation in Modern China: Problems, Perspectives, and Potentials," ASIANetwork Exchange: A Journal for Asian Studies in the Liberal Arts 21, No. 1 (2014).

and cultural practices.[141] Therefore, structures have to remain true to their original forms. By focusing on the educational value of historical structures, appreciation for cultural heritage can be fostered among new generations.

However, there are several challenges to maintaining the original state of historical timber structures. Environmental elements can lead to deterioration over time.[142] Also, the ecological approach to conservation must emphasize understanding these environmental effects while striving to preserve the original state of the structure.[143]

Another challenge is that there is an increasing pressure of modernization and urban development, which can threaten the original state of historical structures. The Chinese government faces enormous pressure to maintain a balance between the conservation of historical structures and modern development; if modernization cannot be integrated with the past, history will be turned into a commodity accessible to only the affluent classes.[144] In many cases, contemporary needs are prioritized over historical authenticity and integrity due to economic incentives.[145] These issues can be dealt with by adopting a balanced approach that focuses on historical authenticity and accommodates modernization; for example, historic sites should be made accessible to the public without causing threats to their structure so that they can be economically supported.

There are various conservation techniques that uphold the principle of not changing the original state. For example, carefully documenting the existing condition of the structure, using

[141] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[142] Peter Brimblecombe, and Jenny Richards, "Moisture as a driver of long-term threats to timber heritage—part II: risks imposed on structures at local sites," Heritage 5, No. 4 (2022).
[143] Knut Einar Larsen, and Nils Marstein, "Conservation of historic timber structures. An ecological approach," Riksantikvaren, (2016).
[144] Lisa Bixenstine Safford, "Cultural Heritage Preservation in Modern China: Problems, Perspectives, and Potentials," *ASIANetwork Exchange: A Journal for Asian Studies in the Liberal Arts* 21, No. 1 (2014).
[145] Larsen and Marstein, "Conservation of historic timber structures. An ecological approach."

non-invasive assessment methods to identify problematic areas, and using techniques that do not alter the original materials are some of the best practices using this principle.[146] Conservationists can use these techniques to maintain the integrity of the timber structures and also acquire critical information for planning effective conservation.

There are some cases when repairs are required, and in such cases, conservationists must carefully select materials and methods because they have to ensure that selected materials are compatible with the original structure.[147] For example, traditional joinery techniques should be used to repair joinery in historical timber structures so that craftsmanship can be maintained.[148] This approach ensures that repaired parts blend with the rest of the structures, maintaining the authenticity. Hence, emphasis should be on repairs that are done without altering the original materials and by following traditional methods.

The objective of the principle of not changing the original state is to ensure that the structures retain their authenticity and historical significance. This principle recommends that conservationists use conservation methods that focus on maintaining the original forms and using original materials. In this way, the historical narratives contained in those structures can be honored. It will also provide future generations with educational opportunities. However, it can be difficult to implement this principle because of the challenges posed by environmental elements and modernization. The solution is to adopt a balanced approach to conservation that

[146] Helena Cruz, David Yeomans, Eleftheria Tsakanika, Nicola Macchioni, Andre Jorissen, Manuel Touza, Massimo Mannucci, and Paulo B. Lourenco, "Guidelines for the on-site assessment of historic timber structures," *International Journal of Architectural Heritage: Conservation, Analysis, and Restoration* 9, No. 3 (2014).
[147] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[148] Knut Einar Larsen, and Nils Marstein, "Conservation of historic timber structures. An ecological approach," Riksantikvaren, (2016).

emphasizes the importance of maintaining the original state of historical structures while accommodating modernization.

Minimum intervention

As the name suggests, this principle allows changes, but those changes have to be limited. In other words, this principle limits significant changes to the original structure while emphasizing stability.[149] This principle allows minimal alterations to ensure structural soundness. Its objective is to preserve the authenticity and integrity of the historic structures. It aligns with the principle of not changing the original state because it also prioritizes maintaining the historical significance of the structures, as shown in Figure 2.4.

Figure 2.4: Chunyang Guan under repair. Photo by Author.

[149] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).

This principle rejects major alterations and emphasizes limited changes because they can compromise their authenticity and destroy their historical value.[150] When conservationists engage in repairs, they should prioritize the preservation of original materials and craftsmanship, and they should minimize any changes that impact the character of the structures, as shown in Figure 2.5. They should carefully assess the existing structure, which can help them decide whether any modifications are necessary and how they should be implemented.[151] This principle can be simply understood as the principle of limiting changes as much as possible.

Figure 2.5: Traditional joinery method. Photo by Author.

This principle is similar, to some extent, to the principle of not changing the original state, as it also emphasizes the importance of maintaining authenticity in conservation. Changes are allowed, but they must be minimal. Conservation methods should focus on using materials

[150] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[151] ICOMOS China, "Principles for the Conservation of Heritage Sites in China."

and techniques that do not affect the original materials and traditional techniques. It is crucial for maintaining the historical narrative of the structure. Another important thing to consider is that when minimal changes are implemented, they should be reversible, which can be ensured by using simple methods and detailing the processes used, so they do not cause issues for future conservation efforts.[152] When changes are reversible, they make it easy for conservationists to repair structures, which ensures that the original state of the structures is intact.

Stability is a top priority of the principle of minimal intervention. A wooden structure is deemed stable only if it is able to maintain its shape and resist deformation.[153] Environmental elements such as moisture and temperature can threaten the stability of wooden structures by weakening its structural integrity. Minimal intervention prioritizes the stability of the structures without significantly changing the original state of the structures. Conservationists can achieve this goal by understanding the unique characteristics and properties of original materials and using similar materials in intervention.

Conservationists can maintain stability by regularly monitoring the condition of the timber structures. Ongoing assessments should be prioritized as they help to identify potential issues that can threaten the stability of the structures in the future, and these assessments can provide conservationists and craftsmen with insights to develop preventive measures that address vulnerabilities without compromising stability.[154] When stability is maintained, the structure can support itself and stand strong.

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[152] Yujie Zhu, "Authenticity and heritage conservation in China: Translation, interpretation, practices," In *Authenticity in Architectural Heritage Conservation, Transcultural Research – Heidelberg Studies on Asia and Europe in a Global Context*, ed. K. Weiber and N. Gutschow (Springer International, 2017).
[153] Knut Einar Larsen, and Nils Marstein, "Conservation of historic timber structures. An ecological approach," Riksantikvaren, (2016).
[154] Lisa Bixenstine Safford, "Cultural Heritage Preservation in Modern China: Problems, Perspectives, and Potentials," *ASIANetwork Exchange: A Journal for Asian Studies in the Liberal Arts* 21, No. 1 (2014).

This principle also states that interventions should be carried out using materials and methods that are identical to those used in the original construction; in this way, new changes will not stand out and will blend well with the overall aesthetic of the structure.[155] Unless it is impossible, conservation should be based on traditional techniques. For example, decayed parts of timber should be repaired using seasoned wood of the same species as the original.[156]

When it is necessary to introduce new elements, such as reinforcements and supporters, to the original structure for its reinforcement, it should be done with caution. New elements need to be well-integrated into the existing structure.[157] These elements should be non-invasive, and the process should be reversible.[158] Some of the traditional reinforcement methods commonly used in conservation are replacing the damaged part, restoring using external support, and reinforcing with minimum structural deformation.[159] These methods not only preserve the historic character of the structure but also enhance its stability without causing major alterations.

The principle of minimal intervention also prioritizes reversibility. Every modification made to the original structure should be reversible so that future conservation can be done without any major difficulties. If changes are irreversible, it will be difficult for future conservationists to restore the affected structure to its original state. Proposed interventions should include reversible changes. They should neither impact or hinder future conservation

[155] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[156] Knut Einar Larsen, and Nils Marstein, "Conservation of historic timber structures. An ecological approach," Riksantikvaren, (2016).
[157] Marco Corradi, Adelaja Israel Osofero, and Antonio Borri, "Repair and reinforcement of historic timber structures with stainless steel—A review," *Metals* 9, No. 1 (2019).
[158] Justyna Jaskowska-Lemanska, and Elzbieta Przesmycka, "Semi-destructive and non-destructive tests of timber structure of various moisture contents," Materials 14, No. 1 (2020).
[159] Ze-li Que, Zhe-rui Li, Xiao-lan Zhang, Zi-ye Yuan, and Biao Pan, "Traditional wooden buildings in China," *Wood in Civil Engineering*, (2017).

work nor limit access to evidence incorporated in the structure.[160] By emphasizing reversibility, conservationists will ensure that the original structure can be retained in future conservation efforts.

An important advantage of this principle is that it encourages the development of a sustainable conservation strategy that also values the cultural significance of the structure. conservationists are encouraged to use and apply sustainable materials and follow traditional methods, so they can maintain the authenticity of the structure and enhance its resilience against environmental elements.[161]

The principle of minimal intervention clearly explains that changes to the original structure are limited, and the focus should be on stability. Conservationists have to study and engage with materials used in the original construction and traditional craftsmanship. It will help them with planning effective repair strategies. They can enhance stability by monitoring the condition of the structure and employing traditional repair methods. This principle prioritizes sustainability and emphasizes the cultural significance of historical wooden structures.

Specific Techniques for Addressing Environmental Damage to Wooden Temples

Regular inspections, timely repairs, and effective conservation techniques are emphasized in a comprehensive approach to conservation and maintenance of historic timber structures. Since timber structures can be easily damaged by environmental stressors, it is necessary that they are regularly monitored and repaired using sustainable conservation methods. Therefore,

[160] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[161] M. Fevereiro, L. Nunes, and J. Ferreira, "Traditional methods of timber protection against bio-deterioration," REHAB, (2014).

conservationists should focus on developing a systematic strategy and ensure their longevity by emphasizing the prevention of the damages caused by the environment.

An extremely effective method that conservationists use to conserve and maintain historic timber structures is regular inspection. It can be easily conducted in the form of on-site assessments. Conducting on-site assessments is beneficial because they help to identify potential issues before they turn into bigger and significant problems. Regular inspections should be conducted with a focus on critical areas that are prone to deterioration, such as joints and connections, and areas with previous damage.[162] The idea behind regular inspections is to identify problematic areas before significant damage has occurred.

In this method, conservationists record and report the condition of the timber by focusing on any signs of rotting, insect infestation, or moisture-related damage.[163] These methods enable conservationists to monitor and track the condition of the structure over time, so they are able to effectively plan future maintenance and repair efforts. It is necessary that they use non-destructive testing methods, such as moisture meters and infrared thermography when conducting regular inspections; in this way, they can avoid further damage to the wood.[164]

Timely repairs are required when early signs of damage are identified, to mitigate deterioration and limit further damage. Conservationists must take prompt action to deal with the issues identified during regular inspections. For example, if fungal growth is detected, it is critical to emphasize immediate treatment so that the spread can be halted and the surrounding

[162] Helena Cruz, David Yeomans, Eleftheria Tsakanika, Nicola Macchioni, Andre Jorissen, Manuel Touza, Massimo Mannucci, and Paulo B. Lourenco, "Guidelines for the on-site assessment of historic timber structures," *International Journal of Architectural Heritage: Conservation, Analysis, and Restoration* 9, No. 3 (2014).
[163] Knut Einar Larsen, and Nils Marstein, "Conservation of historic timber structures. An ecological approach," Riksantikvaren, (2016).
[164] Cruz et al., "Guidelines for the on-site assessment of historic timber structures."

wood can be protected.[165] There are traditional and modern methods used by conservationists. Traditional methods of protecting timber against biodeterioration include the use of natural preservatives and physical barriers that prevent access to fungi and insects.[166]

Figure 2.6: Soaking wood in medical solution, such as polyethylene glycol, to prevent cracking and infestation. Photo by Author.

As shown in Figure 2.6, modern products used in anti-cracking treatment include polyethylene glycol (PEG), which can replace the moisture in the cells of wood and slow down shrinkage and warping during the drying process; silicone oil or sealant treatment that reduces the rate of water evaporation and improving the flexibility of the wood; and glycerin that can maintain the elasticity of wood and reduce the occurrence of fine cracks. Similarly, insect

[165] Jagjit Singh, "Fungal problems in historic buildings," *Journal of Architectural Conservation* 6, No. 1 (2000).
[166] M. Fevereiro, L. Nunes, and J. Ferreira, "Traditional methods of timber protection against bio-deterioration," REHAB, (2014).

infestation can be controlled by using boric acid and borax solutions that are environmentally friendly preservatives and can effectively prevent damage by pests such as termites. Other solutions include permethrin, which forms a long-lasting protective barrier, making it particularly suitable for insect control on outdoor wooden structures; and CCA (Chromated Copper Arsenate) and ACQ (Alkaline Copper Quaternary) preservatives, environmentally friendly alternatives with good termite repellent properties.

Materials and techniques compatible with the original construction should be used to carry out repairs. This approach preserves the aesthetic integrity of the structure and ensures that the repairs do not introduce new vulnerabilities. For example, when repairing damaged timber, it is important to use wood from the same species as the original so that consistency in structural appearance and properties can be maintained.[167]

Conservation techniques must prioritize minimal intervention so that much of the original material remains intact. The general principle in conservation practice in China is to conserve and protect the authenticity and integrity of the historic structure.[168] When conservationists adopt an ecological approach to conservation, they emphasize the need to understand the historical context of the structure so that they can better assess materials used in its construction.[169]

Applying a protective coating on timber based on the properties of the timber is an example of an effective conservation technique because it allows the timber to breathe while providing a barrier against moisture and radiation; some commonly used protective coatings are

[167] M. Fevereiro, L. Nunes, and J. Ferreira, "Traditional methods of timber protection against bio-deterioration," REHAB, (2014).
[168] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[169] Knut Einar Larsen, and Nils Marstein, "Conservation of historic timber structures. An ecological approach," Riksantikvaren, (2016).

natural oil finishes, paints, and water repellents.[170] Another example is the use of insect pheromones; conservationists use them to make the wood less desirable for wood-digesting insects.[171] Similarly, installing proper ventilation within wooden structures, such as air exhaust and air conditioners, is another example of effective conservation; it can help with controlling humidity levels.[172] These conservation techniques are easy to implement, but climate control systems can be expensive. They can help prevent damage caused by moisture and reduce the risk of fungal growth and insect infestation.

Repairs should always emphasize the use of traditional craftsmanship techniques. These traditional techniques not only help to conserve the historical authenticity of the structure but also support the continuation of valuable skills related to timber construction.[173] This shows that a more sustainable approach to conservation can be developed by integrating traditional methods with modern practices, such as using chemical sealers as coating and enforcement using rigid steel supporters.

It can be difficult to determine which conservation techniques to use. This issue can be resolved by assessing the vulnerabilities of timber structures. In this way, conservationists can plan out and develop effective conservation strategies. Research shows that there is a correlation between different failure modes in historical timber structures, and conducting a comprehensive vulnerability analysis can inform repair strategies; depending on the type of structure, failures can occur differently, and identifying the failure mode is important to come up with the relevant

[170] Larsen and Marstein, "Conservation of historic timber structures. An ecological approach."
[171] M. Fevereiro, L. Nunes, and J. Ferreira, "Traditional methods of timber protection against bio-deterioration," REHAB, (2014).
[172] Peter Brimblecombe, and Jenny Richards, "Moisture as a driver of long-term threats to timber heritage—part II: risks imposed on structures at local sites," Heritage 5, No. 4 (2022).
[173] Carl Elefante, "Changing World, Evolving Value: A Historic Presentation Roadmap Toward 2050," *Journal of Preservation Technology* 48, No. 2-3 (2017).

strategy.[174] This means that conservation techniques should be designed to address specific challenges and issues.

A comprehensive strategy for conservation cannot be successful if education and training are overlooked. Education and training can help with regenerating the values related to the cultural significance of historic timber structures, which supports sustainable conservation in China.[175] Conservationists in China should focus on teaching traditional construction techniques, conservation methods, and regular maintenance. These programs will foster a new generation of skilled craftsmen and conservationists. They will learn and preserve the skills and techniques needed for maintaining historical structures.

The conservation and maintenance of historical timber structures can be done by focusing on regular inspections, timely repairs, and effective conservation techniques. These methods help to identify potential issues and mitigate them in an effective and sustainable way so that the longevity and integrity of the historical structures can be ensured.

Modern Techniques in Temple Conservation

Use of Modern Materials and Technologies

New materials and technologies can work for old wood, although conservationists recommend using old materials and methods for heritage conservation, new materials and methods can solve problems that cannot be solved with old methods. Science and technology have made it easier for conservationists to find solutions, but they should not overdo it with the

[174] Junhong Huan, Donghui Ma, and Wei Wang, "Vulnerability analysis of ancient timber architecture by considering the correlation of different failure modes," *Mathematical Problems in Engineering* 1 (2018).
[175] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).

new materials and technologies or it will compromise the cultural value of the old structure. As shown in Figure 2.7, modern methods can be used to support old structures.

Stainless steel, advanced polymers, and engineered wood products are some of the modern materials used to repair and strengthen historic timber structures. Stainless steel is used to reinforce timber and since it is strong and corrosion-resistant, it improves the stability of the structure.[176] It is particularly useful in areas where traditional materials cannot withstand environmental stressors like moisture and pests. Stainless steel can be used as connectors and reinforcements. By using modern materials like stainless steel, conservationists can strengthen historic timber structures and minimize visible changes to the original design by skillfully integrating them so that they do not stand out.

[176] Marco Corradi, Adelaja Israel Osofero, and Antonio Borri, "Repair and reinforcement of historic timber structures with stainless steel—A review," *Metals* 9, No. 1 (2019).

Figure 2.7: Repaired wood component of Chunyang Guan. Photo by Author.

Another modern material is advanced polymers like resins. They too can repair historic timber structures. They can be used to repair without changing the original structure. Resins are very effective in prosthetic repair when parts of the timber are missing and need to be restored and the advantage of using resins is that they can be matched to the mechanical properties of the original timber.[177] Repairs done with resins do not introduce new weaknesses. These materials

[177] Thierry Descamps, Coralie Avez, Olivier Carpentier, Emmanuel Antczak, and Gi Young Jeong, "Historic timber roofs modelling: prosthesis and resin repairs," *Journal of Heritage Conservation* 47 (2016).

offer flexible and durable repair solutions. Hence, they are key to the longevity of historic timber structures.

One of the modern technologies used in historic timber structure conservation is non-destructive testing (NDT) methods, which can assess the condition of the timber without causing any damage and provide valuable data on moisture content, structural integrity and potential areas of concern.[178] This technology facilitates data collection and supports conservation planning.

Another is the use of sensors and digital monitoring systems. These technologies can monitor environmental conditions that affect timber structures, so conservationists can make informed decisions on maintenance and repairs.[179] By using these technologies, conservationists can do timely intervention. Conservation is enhanced by these technologies because problems can be detected early and solutions can be developed quickly.

Three-dimensional (3D) scanning and modeling is a relatively new conservation method. Conservationists can create digital copies of cultural sites using 3D scanning and modeling, and it provides detailed documentation of the existing condition of the structure, so they can visualize the interventions before they do it.[180] Another advantage of these technologies is that they can improve public engagement and education regarding historical structures. When digital models are accessible to the public, they can better appreciate their cultural heritage, which will foster a

[178] Alberto Cavalli, and Marco Togni, "Monitoring of historical timber structures: state of the art and prospective." Journal of Civil Structural Health Monitoring 5, (2015).
[179] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[180] Hua Zhang, Wuping Gao, and Yanling Wang, "A Wooden Pin Reinforcement of Ancient Chinese Wooden Temple: A Case of Daxiong Hall," 中国古代木结构寺庙的木销加固：以大雄宝殿为例 Advances in Civil Engineering, (2024).

sense of responsibility for conservation efforts. This means that the public can be involved in conservation initiatives.

Although there are several advantages of modern materials and technologies, their use can give rise to a number of issues, such as compatibility. Using modern materials can give rise to a number of issues due to weathering, lack of redundancy, and the use of non-durable materials. For example, if thermal expansion rates between modern materials and traditional timber are different, it will result in stress concentrations, leading to significant damage over time.[181] Therefore, modern materials that are compatible or suitable with traditional materials should be used; it means that those materials should support the properties of the wood. Also, when modern materials are well-integrated into the original structure, there is no threat to the aesthetic. While stability is the priority, it is equally important to focus on preserving the visual character of the structure. It can be challenging to find a balance between modern interventions and the preservation of original design.

Modern materials and technologies can provide better durability and stability than traditional materials and methods. They can help conservationists come up with better plans. However, they have to use modern materials and technology and not compromise the historical integrity and aesthetic value of the structures. Conservationists must integrate modern solutions to the conservation of historic wooden structures with careful thought and planning.

[181] Deborah Slaton, "Challenges of modern materials: assessment and repair," *Journal of Architecture Conservation* 23, No. 1-2 (2017).

Key Processes of Modern Conservation

a. Roof waterproofing

Roof waterproofing is good for areas prone to moisture and environmental degradation. It is a process of making the roof more resistant to leaks caused by rain and snow; this can protect the roof from water intrusion and reduce the chance of rot and structural failure.[182]

In this process, several materials can be used to protect the roof. A group of researchers in China developed a new roof waterproofing membrane for historic Chinese timber structures and found out that the new adaptive membrane not only improved water resistance but also allowed timber movement.[183] This material kept the structure intact. They are able to not only conform to complex roof geometries but also provide effective adhesion to ensure complete protection against water leaks, which makes them a cost-effective solution for conserving historical roofs because they are suitable for both construction and renovations.

b. Wall salt drainage

This method is useful to preserve historic structures that are affected by salt drainage due to moisture ingress. Salts can accumulate in masonry and plaster, leading to efflorescence and deterioration if left unchecked; this is important because many wooden temples have structures made of stone and plaster. Understanding the behavior of salts is critical to effective conservation strategies; there should be proper drainage solutions so that moisture penetration

[182] Qing Chun, Hui Jin, Yiwei Hua, Wenjie Zang, Xutao Lin, and Jiheng Jiang, "Research on a new adaptive roof waterproofing membrane to improve water resistance of traditional Chinese timber buildings," *Journal of Asian Architecture and Building Engineering* 21, No. 6 (2022).
[183] Chun et al., "Research on a new adaptive roof waterproofing membrane to improve water resistance of traditional Chinese timber buildings."

can be minimized, which will, in turn, help to deal with salt-related issues.[184] When moisture penetration is reduced, salts will not accumulate and cause deterioration.

In order to ensure proper drainage, the exterior of the structure should be well-maintained, and sources of moisture such as leaks and rising dampness should be identified and mitigated; walls and ceilings can be susceptible to salt damage, so it is important to repair them.[185] By maintaining the integrity of those surfaces, the risk of salt accumulation will be reduced. However, if salt damage has already occurred, affected plaster should be removed, and the walls should be rendered with salt-resistant materials that are compatible with traditional materials.[186] In this way, historical structures can be protected from future salt-related destruction, which will ensure the stability of the structures.

c. Wall reinforcement

Historical timber structures tend to be vulnerable to environmental factors and deterioration, so reinforcement is crucial for their conservation. Wall reinforcement is the process of strengthening the structure during its construction or renovation so that the structure can withstand various stresses and maintain its historical integrity.

One of the common methods used in wall reinforcements is the use of specially designed structures to support unstable walls of the temple, as shown in Figure 2.8. Modern materials like steel are widely used in this process. Breathable materials should be used because they allow moisture to escape and provide structural support; this mainly applies to historic stucco and

[184] Anne Grimmer, "22 Preservation Briefs: The Preservation and Repair of Historic Stucco," U.S. Department of the Interior National Park Service, (1990).
[185] Marylee MacDonald, "21 Preservation Briefs: Repairing Historic Flat Plaster– Walls and Ceilings," U.S. Department of the Interior National Park Service, (1989).
[186] MacDonald, "21 Preservation Briefs: Repairing Historic Flat Plaster– Walls and Ceilings."

plaster walls that are present in many wooden temples in China, as they can easily suffer from moisture-related issues if they are improperly reinforced.[187]

Figure 2.8: Wall reinforcement used in Chunyang Guan. Photo by Author.

It is also useful to integrate steel mesh or carbon fiber materials to reinforce walls. They can enhance the structural capacity of walls without compromising their aesthetic value; they can be used to repair flat plaster walls used in repaired temples and provide additional strength

[187] Anne Grimmer, "22 Preservation Briefs: The Preservation and Repair of Historic Stucco," U.S. Department of the Interior National Park Service, (1990).

without compromising the original appearance.[188] These materials can provide strength to weakened parts of the structure.

It is also important to reinforce walls that surround windows because it can significantly improve the overall stability of the structure; the reinforcement methods must be compatible with the original materials so that the longevity of the historical structures can be ensured.[189] Their authenticity and character can be maintained. Wall reinforcement is vital for protecting the structural integrity of historical structures and helping them withstand environmental challenges.

d. Wood component gluing and large wood member replacements

Another important method of conservation of historical timber structures is wood component gluing and large wood member replacements. In this method, proper adhesion products should be used in order to achieve effective repair while maintaining the structural integrity and aesthetic value of timber structures. When wooden components fall off the original structure, it is critical to re-glue them back to the exact position to restore functionality.[190] It not only supports functionality but also preserves original materials.

In some cases, large wood members need to be replaced because they have adversely decayed and can threaten the structural integrity of the structure. In this case, adhesives that are compatible with the existing materials should be selected. The key criteria for selecting adhesive is that it must provide a strong bond but can be reversed.[191] The focus is on reversibility because

[188] Marylee MacDonald, "21 Preservation Briefs: Repairing Historic Flat Plaster– Walls and Ceilings," U.S. Department of the Interior National Park Service, (1989).
[189] John H. Myers, "Preservation Briefs: 9: The Repair of Historic Wooden Windows," U.S. Department of the Interior National Park Service, (1981).
[190] Myers, "Preservation Briefs: 9: The Repair of Historic Wooden Windows."
[191] Anne Grimmer, "22 Preservation Briefs: The Preservation and Repair of Historic Stucco," U.S. Department of the Interior National Park Service, (1990).

it allows future conservationists to restore the original state if necessary. It helps to maintain the historical authenticity of the structure.

Modern adhesives such as epoxy resins are commonly used to glue wood components because they have excellent bonding capabilities and are resistant to environmental factors, but their aging properties can affect the overall durability of repairs.[192] Therefore, it is essential to evaluate the long-term performance of those adhesives. If possible, traditional adhesives, such as mixtures of different oils and soils, should be used to glue wood components, which aligns with the guiding principles of the conservation of historic timber structures.

Material selection and repair techniques should be carefully planned to achieve effective wood component gluing and large wood member replacements. Modern adhesives can be effective in the short term, but it is necessary to emphasize long-term performance so that the integrity and historical value of the structures can be maintained.

Variabilities in climate and environmental conditions can lead to several environmental risks for historic wooden structures. They significantly affect the stability and integrity of historic wooden temples. There are traditional and modern methods to repair and restore those temples, but it is recommended that traditional methods are used more than modern methods because authenticity is prioritized. When modern methods are used efficiently, they can provide support to the structure without compromising its identity. In the next chapter, the case studies of two important temples will be conducted, which will help to understand the process of restoration of historic temples in China.

[192] Marylee MacDonald, "21 Preservation Briefs: Repairing Historic Flat Plaster– Walls and Ceilings," U.S. Department of the Interior National Park Service, (1989).

Chapter 3: Case Studies- Rehabilitation of Guanyin Temple and Chunyang Guan Temple

This chapter will provide an introduction to two contrasting case studies and then discuss their historical background, restoration challenges, restoration focus, and cultural and religious significance. The Guanyin Temple is used in this study as a case of unprotected heritage, while the Chunyang Guan Temple is used as a case of protected heritage.

Guanyin Temple: A Case of Unprotected Heritage

Historical Background

The Guanyin Temple is located in Xinjin County of Sichuan Province. It was built in 1181 during the Southern Song Dynasty and is one of the few large and intact temples in Sichuan.[193] This temple is a prime example of traditional Chinese timber architecture and a significant historical and cultural site in China, as shown in Figure 3.1. It is dedicated to Guanyin, one of the most important Buddhist deities in China; the statue of the goddess is the most exquisite of all the treasures of the temple.[194] The temple has experienced and endured various phases of destruction and restoration over the centuries. It does not look the same as when it was first built. According to the Xinjin County Records of Qingdaoguang, which is the earliest and most complete county records of Xinjin, many of the buildings of the Guanyin

[193] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[194] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple,"观音寺的历史与壁画.

Temple were rebuilt by monks during the Jingtai era of the Ming Dynasty, and new structures were added to the temple.[195]

The temple's halls, pavilions, corridors, and platforms, which are some of the essential characteristics of ancient Chinese architecture,[196] exist in a diminished state. Many of the old buildings have been lost, and a total of nine buildings exist at present; seven buildings are from the Ming and Qing dynasties, and there are two new modern buildings (Zhu, 2023).[197] The construction of the temple began in the Chunxi era during the rule of Emperor Xiaozong of the Southern Song Dynasty. Historical records related to the temple during this era have been lost because of a war; the details of the war are not available.[198] Yet, it is known that during this period, extravagant buildings were constructed, which reflected economic prosperity, and they also contributed to the development of Chinese architecture.[199] During the Ming Dynasty, the identity of the temple was largely shaped. In 1426, early in the reign of Emperor Xuande (1425-1435), the reconstruction of the temple began, as it was severely damaged, and his successors continued to repair and add new structures to the temple. For example, during the Tianshun era (1462), Pilu Temple was built, and during the Chenghua era (1466), the Buddha statue was added to the temple.[200]

However, in the Shunzhi era (1644) of the Qing Dynasty, the temple was looted and destroyed by the rebels led by Zhang Xianzong in another war. Repairs were carried out for several years by several emperors; during the Daoguang era (1838), the main hall of Guanyin

[195] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[196] Zhixia Qiao, Ancient Chinese Temples, (Beijing: China Business Press, 2015).
[197] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[198] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[199] Huiyin Lin, 林徽因 Common Sense of Chinese Architecture, 中国建筑常识 Beijing Institute of Technology Press, 2017.
[200] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."

was restored, and during the Guangxu era (1888), the Jade Royal Tower was rebuilt.[201] The repair work and renovations conducted during the Qing and Ming dynasties not only preserved the identity of the temple but also added to the grandeur and functionality of the temple as a place of worship. The architecture of the Ming Dynasty was characterized by fine and exquisite workmanship and emphasis on elegance, while the Qing architecture focused on elaborate ornamentation and utilized luxurious materials.[202] This influenced the restoration process of the temple during those dynasties; different methods and designs were added by the conservationists of those dynasties.

Figure 3.1: Guanyin Temple. Photo by Author.

The repairs and renovations done during each period of turmoil due to wars led to a complex layering of architectural styles of different dynasties, which makes the temple unique

[201] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[202] Huiyin Lin, 林徽因 Common Sense of Chinese Architecture, 中国建筑常识 Beijing Institute of Technology Press, 2017.

and adds to its cultural significance. Only some of the structures and monuments built during the Ming and Qing dynasties, such as the Main Hall and the Pilu Temple, exist in the temple complex at present. The craftsmanship and aesthetic values of each dynasty can be observed in the existing buildings. There are exquisite murals, stone carvings, and relief sculptures from the Ming Dynasty hidden in the Pilu Hall, also called Vairocana Hall; the statue of Guanyin is about 2.5 meters tall and is surrounded by dozens of statues of Bodhisattvas, and the luxurious materials used for restoration during the Qing Dynasty can be observed in the ornamentation.[203]

The two important buildings of the Guanyin Temple are the Pilu Hall and Guanyin Hall, and they represent the exquisite architectural style of the Ming Dynasty. The Pilu Hall was built in 1462 during the reign of Emperor Yingzong; there are dragon and tiger images painted on the left and right walls outside the hall, which symbolizes that Buddhism creates a space where dragons and tigers lie dormant.[204] The temple also has murals and sculptures that reflect the meticulous and rigorous techniques used by the architects during the Ming Dynasty. These buildings and murals are marvels of the past dynasties; they can be used to study ancient aesthetics and techniques, and these skills and knowledge can be transferred to future generations.[205]

The Twelve Realizations of the Path that exist in the Guanyin Temple are considered the most exquisite and noble aesthetic model of Chinese temple murals; it was created using rich and elegant colors in a luxurious style, representing the highest artistic level of the Ming Dynasty.[206] Since the building material of the temple was mostly wood, the use of brilliant colors not only

[203] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple,"观音寺的历史与壁画.
[204] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple."
[205] Ping Yu, "Research on the Inheritance and Protection of Temple Architecture Construction Techniques," China Academic Journal Electronic Publishing House (2015): 247.
[206] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple."

had a decorative purpose but also provided protection.[207] The Guanyin Temple was destroyed in the war during the Yuan Dynasty, and then during the Ming Dynasty, it was rebuilt on the ruins of the original temple; during the Qing Dynasty, it was given a new look as it underwent about eleven renovations.[208] It is a miracle that the temple has survived for centuries, and it is one of the most important treasures of Chinese Buddhist architecture.

The evolution of the temple is ongoing, as it has been touched by modernity, as it is accessible to the public, and their interaction with the temple influences its restoration. It serves as not only a religious site for believers but also a cultural heritage site that attracts visitors from different parts of the world. In 1956, it was listed as a key cultural relics protection unit, which is a designation given to sites that are eligible for protection by the government, in Sichuan Province, and in 2001, it was listed as a national key cultural relics protection unit.[209] The temple still stands despite enduring centuries of destruction and renovations, which reflects its resilience. Although its appearance has changed, its identity as cultural heritage remains intact.

This temple has been a dedicated space for the veneration of Guanyin since its establishment. Practitioners and believers see this temple as a sanctuary where they can find spiritual guidance and nourishment. The Pilu Hall of the Guanyin Temple has three areas: the statue of Guanyin is placed in the first area, the second area is for worship, and the third area is for sightseeing.[210] Visitors are able to pass through the hall and worship Guanyin in the front and then get to the sightseeing area.

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[207] Jianxin Xiong, "Traditional Culture and Architectural Design–Take Temple Architectural Design as An Example," Literary Debate: Art History (2010).
[208] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple,"观音寺的历史与壁画.
[209] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[210] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."

The method of worship in the temple changed as one dynasty was replaced by another and as Buddhism developed. During the Ming and Qing dynasties, worship ceremonies were regular activities, and they were conducted in the main hall of the Guanyin Temple; morning and evening worship was carried out in front of the statue of Guanyin.[211] Those activities are still carried out in the temple. It serves the spiritual needs of the believers and encourages community engagement.

Restoration Issues

The Guanyin Temple's destruction and reconstruction under different dynasties has complicated the restoration process. During the Southern Song Dynasty, the cities flourished, and art and architecture were emphasized and supported. The dynasty eventually fell when the Mongols attacked, and during this war, many buildings and monuments were destroyed.[212] The Mongols were finally defeated, and the Ming Dynasty was established. During the Ming Dynasty, the emphasis was on reestablishing the proper order of a Chinese dynasty, but it fell and was replaced by the Qing Dynasty, during which there was an increased interest in ancient texts and the conservation of Chinese heritage.[213] These changes also affected the restoration of the Guanyin Temple. According to the Xinjin County records of Qingdaoguang, monks played an important role in rebuilding the destroyed temple during the Jingtai era.[214] The temple restoration processes conducted during these dynasties were different because their focus was different; the Ming conservationists focused on elegance, while the Qing conservationists

[211] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[212] R. Kent Guy, "Song to Qing: Late Imperial or Early Modern?" In A Companion to Chinese History, ed. M. Szonyi (Wiley Blackwell, 2017).
[213] Guy, "Song to Qing: Late Imperial or Early Modern?"
[214] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.

emphasized elaborate ornamentation.[215] This means that there was no consistency in protection methods. There have been significant challenges to the restoration of this temple, primarily the lack of historical protection and the impact of wars and the environment.

The first challenge to the restoration of the Guanyin Temple is the lack of historical protection, which means that the temple was not designated as a historical site for a long period of time. There have not been consistent conservation efforts, which has caused the temple to face severe structural damage over time. This means that many of the original architectural features of the temple deteriorated without intervention. The temple originally had several halls and buildings, but at present, there are only nine halls left.[216]

The records that are publicly available refer only to the rebuilding of the temple that was conducted in the Ming and Qing dynasties; not much is known about the original temple built in the Southern Song Dynasty. The temple received support for repair and renovation during the Ming and Qing dynasties, but it was not consistently protected, which means that the temple was not repaired regularly as there was no protection provided by the government. Between 1939 and 1941, researchers from the Construction Society studied the temple, and in 1956, it was finally listed as a cultural relics protection unit in Sichuan Province, so it was offered protection by the government.[217] When the temple was first analyzed and studied in 1941, it was described as the biggest temple in the Ming Dynasty in Sichuan.[218] The lack of records does not mean that there was no protection, but the fact that the temple built during the Southern Song Dynasty was only granted formal protection in 1956 makes it clear that the temple did not receive consistent

[215] Huiyin Lin, 林徽因 Common Sense of Chinese Architecture, 中国建筑常识 Beijing Institute of Technology Press, 2017.
[216] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[217] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[218] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."

protection. Many of the elements that once characterized the grandeur of the temple have been lost, and today, it exists in its diminished state. The fact that the extensive study of the temple only began after 1939 helps to understand how long the temple was neglected.

The impact of wars and the environment also created challenges for restoration. The temple has been destroyed twice due to wars, due to which its restoration was complicated, and the conservationists of those times could not preserve the original state of the temple. During the late Southern Song Dynasty, there was a war that seriously damaged the temple, but not much was done to preserve the monuments at that time, as the repair work started during the Ming Dynasty.[219] Then, during the late Ming Dynasty, the temple was again destroyed, and it happened because of the rebellion led by Zhang Xianzhong, but it was not neglected this time, as renovations were started by monks.[220]

The temple's restoration efforts have also been hindered by the environmental factors discussed in Chapter 2. The lack of adequate repair over centuries compounded the extent of the environmental damage. The temple is located on Jiulian Mountain; in this area, there are several tall mountains in the range of 2,000 to 3,000 meters high. The temple is hidden within these mountains with high humidity and little sunlight.[221] When humidity is high, there is a high probability of fungal attack, and inadequate sunlight means wetter conditions, which contribute to decay in ancient timber structures.[222] Because of these environmental factors, the Guanyin Temple has experienced a weakened foundation, water damage, and fungal growth, which makes restoration more difficult. The walls of the temple have been subjected to cracking, and murals

[219] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[220] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[221] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[222] Jenny Richards, and Peter Brimblecombe, "Moisture as a Driver of Long-Term Threats to Timber Heritage–Part I: Changing Heritage Climatology," Heritage 5, No. 3(2022).

are partially damaged, while the stability of the temple is compromised.[223] The temple was prone to decay and damage, and without proper repair, the damage was exacerbated.[224]

Although the temple is religiously and culturally significant, there has been a decline in visitors over the years. As a result, local efforts to protect and maintain the legacy of the temple have decreased. Cultural heritage is an essential component of not only beautification but also economic development of the region; in China, cultural heritage sites are redeveloped with a focus on cultural and economic values.[225] When people visit cultural heritage sites, there is an increase in economic activity, which can help with the protection of the site as well as the development of the region. However, the decline in visitors to the Guanyin Temple has created difficulties for the local government to protect the temple.

Buddhist temples in China are not just for holding religious activities; they are also places where monks live and study. According to the Constitution of China, Chinese citizens have the freedom of belief in religion, so they are allowed to practice Buddhism in temples or at home.[226] Chinese people are free to choose their religion and how they practice it. China has undergone rapid urbanization and modernization, due to which societal values have drastically shifted. Statistics show that fewer than one in ten Chinese adults tend to identify with Buddhism.[227] One of the main reasons for the decline in visitors to the Guanyin Temple is the decreased public interest in Buddhism.

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[223] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple,"观音寺的历史与壁画.
[224] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[225] Yujie Zhu, and Placido Gonzalez Martinez, "Heritage, values and gentrification: the redevelopment of historic areas in China," International Journal of Heritage Studies 28, No. 4 (2024).
[226] Zhixia Qiao, Ancient Chinese Temples, (Beijing: China Business Press, 2015).
[227] Pew Research Center, "Measuring Religion in China: Buddhism," updated 2023, https://www.pewresearch.org/religion/2023/08/30/buddhism/.

As fewer individuals visit temples and engage with temple practices, their connection to the cultural site decreases. The Guanyin Temple is facing the same situation. The lack of public interest in Buddhism has caused issues in the restoration of the temple. Maintenance and restoration cannot be done without funding, and visitors play an important role in funding those efforts. The local government is struggling to allocate resources to preserve the temple because of the lack of public support and engagement with the temple.

Restoration Focus

The restoration of the Guanyin Temple emphasized recreating the architectural layout based on the records from the Ming and Qing Dynasties while addressing significant structural issues caused by years of neglect and damage. The approach to restoration of this temple was careful and respectful, ensuring that the intervention did not negatively impact the temple's identity and significance. This aligns with the general principle of conservation promoted in China, which states that the authenticity and integrity of historic structures must be protected.[228] The top priority of the conservationists was to maintain the historical integrity of the temple by ensuring that the original architectural features of the temple remained intact. In China, conservation is about protecting and preserving the authenticity and integrity of the cultural site, and good conservation of a cultural site involves the elimination of elements that threaten the site.[229]

The restoration process started in the 1940s by documenting the existing architectural layout of the temple. In 1941, the Construction Society visited the Guanyin Temple and recorded

[228] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[229] ICOMOS China, "Principles for the Conservation of Heritage Sites in China."

the structure of the temple, which was similar to the structure after the renovation in the last year of the Qing Dynasty, but after the Cultural Revolution, the structure changed.[230]

The photographs taken by the Construction Society in 1941 were used to understand the temple's structure before the Cultural Revolution. For example, when the old and new photos of the Pilu Hall of the Guanyin Temple were compared, it was found that the main wooden frame and interior furnishings were the same, but connecting transition space outside the main building had disappeared, and the original two-story pavilion between the Pilu Hall and the Guanyinzheng Hall had been completely destroyed.[231] The existing buildings showcase the traditional architecture of the Ming and Qing dynasties, during which the temple underwent major renovations. The restoration efforts concentrated on restoring the aesthetic qualities that characterized the temple during the Ming and Qing dynasties. The structural challenges faced by the restoration team included decayed wooden frames, damaged walls, and deteriorated decorations. For example, Wuguanzhi, which is the place where monks eat their food, is located in the south of the Pilu Hall, and it was renovated by replacing the wall, refurbishing the doors and windows, and painting the wood surface using mixture of traditional oil and clay to prevent worms and mold growth.[232]

Since much of the Guanyin Temple was built using timber, the restoration team faced the challenge of finding suitable materials and traditional craftsmen. In ancient China, timber was the preferred material for temple construction, but now it is scarce, which creates major restoration issues as materials used in restoration have to be compatible. In China, authenticity or

[230] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[231] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[232] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."

originality is the focus of the conservation of historic sites, and it covers not only form and design but also materials and technology.[233] The Erdaoshan Gate of the Guanyin Temple is a traditional wooden structure from the Qing Dynasty; the comparison between old photographs taken by the Construction Society and new photographs shows that the hall was renovated after the Qing Dynasty; ornamentation and decoration were added, but its architectural form and overall framework remain the same.[234]

The Chunyang Guan Temple suffered from serious termite infestation; the damaged components were repaired by grafting the hollow spaces and applying protective paint and adhesives.[235] Ancient Chinese architects developed lacquer that can be painted over the wood surface, protecting it from environmental factors; lacquer is made from resin extracted from the lacquer tree.[236] This material is not widely used and can be difficult to procure. Instead of using chemical paint that can give rise to additional problems for the wood, using lacquer can be more cost-effective and sustainable. Similarly, it can be challenging for unskilled artisans to repaint deteriorated murals. The restoration of the murals in the Chunyang Guan Temple was done by limiting intervention as much as possible.

The buildings of the Guanyin Temple showcase exquisite craftsmanship. However, many of the paintings and decorations have been damaged to some extent, and repairing them has been challenging because finding skilled artisans who know traditional craftsmanship was another major issue in the restoration process. The techniques that were used in historical construction

[233] ICOMOS China, "Principles for the Conservation of Heritage Sites in China," State Administration of Cultural Heritage, (2015).
[234] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[235] Changrong Dan, 但昌荣 and Xinyu Wang.王新宇 "Protection of Zhi Xiaoting Special Construction Scheme." 至孝亭保护专项施工方案. Chengdu Boyi Cultural Relics Protection Engineering Co, (2023).
[236] Zhixia Qiao, Ancient Chinese Temples, (Beijing: China Business Press, 2015).

have diminished over time because the number of artisans has reduced, which makes it more difficult to reproduce intricate woodwork and decorations. The mural paintings in the hall between the Pilu Hall and Guayin Hall contain exquisite depictions of landscapes and plum blossoms, but their visibility and clarity has deteriorated over time.[237] The architecture of the temple has been modified to expand worship space for believers; the central column was removed from the roof truss in the main hall, and the front gold pillars were moved to the back after the temple was designated as a historical site in the 1950s.[238] In order to restore these structures, traditional methods should be used so that authenticity can be maintained and the temple's legacy can be honored.

Chunyang Guan Temple: A Case of Well-Protected Heritage

Historical Background

Unlike the Guanyin Temple, the Chunyang Guan Temple is a case of well-protected heritage. The Chunyang Guan Temple is known as the "World's First Confucian Forest of Loyalty and Filial Piety." It is one of the most significant cultural and religious sites in China, as shown in Figure 3.2. It is located in the same region as the Guanyin Temple, the Xinjin District of Chengdu in Sichuan Province. The temple was built in the Guangxu era of the Qing Dynasty and is an excellent example of a modern Chinese temple. Its construction began in the 1880s as a series of altars for local deities. In the 1890s, it was changed to a temple dedicated to Lu

[237] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[238] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.

Dongbin, one of the Eight Immortals of Daoism. Between 1909 and 1937, it was enlarged as a site for Confucian virtues.[239] Its construction continued in modern China until the late 1930s.[240]

Figure 3.2: Aerial view of Chunyang Guan. Image source: Chengdu Xinjin Culture, Sports, and Tourism Bureau.

The Chunyang Guan Temple is built on a grand scale with magnificent pavilions and halls that are covered with exquisite carvings. The main buildings are the Dazhong Pavilion and Zhixiao Pavilion, which house around 324 statues of Confucian figures from the past dynasties. The pavilions are surrounded by forty-four small buildings with cross-braced doorways.[241]

At present, the temple represents a variety of religions, including Confucianism, Daoism, and Buddhism. It integrates the teachings of those three religions as it has evolved through

[239] Elena Valussi, "The Chunyang guan and the multivocality of a religious space," Mapping Religious Diversity in Modern Sichuan, updated 2021, https://sichuanreligions.com/the-chunyang-guan-%E7%B4%94%E9%99%BD%E8%A7%80-and-the-multivocality-of-a-religious-space/.
[240] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.
[241] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.

various historical contexts. The temple was built during the late Qing Dynasty, a period marked by social and political upheaval and a rapidly growing interest in Confucian values as a means of moral guidance. The Opium War between China and Britain between 1839 and 1860 led to significant social and economic disruption in China, and the influence of imperialism and foreign capitalists grew, leading to social disorder and chaos and negatively impacting Chinese traditions. This tumultuous period drove Chinese people to preserve their cultural traditions, where they found solace.[242]

During this period of chaos and disorder, the Chunyang Guan Temple served as a center for the promotion of traditional values and beliefs, such as loyalty and filial piety, the two most important virtues in Confucianism.[243] Daoism and Buddhism coexist alongside Confucianism in this temple, which can be observed in its architecture. There is a multifaceted religious significance in the architectural design of this temple. It includes altars dedicated to different deities, supporting diverse religious practices. There are statues and sculptures of Daoist and Buddhist deities. The large compound of the temple leads to a hall dedicated to the Buddhist deity Guanyin.[244] Dazhong Pavillion and Zhixiao Pavillion are dedicated to the virtues of Daoism and Confucianism, respectively.[245] Due to its support of religious diversity and integration of diverse religious elements, the temple was able to adapt to changing societal needs over time because people followed different religions, and this temple brought them together.

[242] Huiyin Lin, 林徽因 Common Sense of Chinese Architecture, 中国建筑常识 Beijing Institute of Technology Press, 2017.
[243] Lin, 林徽因 Common Sense of Chinese Architecture.
[244] Elena Valussi, "The Chunyang guan and the multivocality of a religious space," Mapping Religious Diversity in Modern Sichuan, updated 2021, https://sichuanreligions.com/the-chunyang-guan-%E7%B4%94%E9%99%BD%E8%A7%80-and-the-multivocality-of-a-religious-space/.
[245] Changrong Dan, 但昌荣 and Xinyu Wang.王新宇 "Protection of Zhi Xiaoting Special Construction Scheme." 至孝亭保护专项施工方案. Chengdu Boyi Cultural Relics Protection Engineering Co, (2023).

Since it was built in the late Qing Dynasty, its architectural features slightly differ from those of the temples built during the past dynasties. This temple is not specifically a Buddhist temple, as it contains elements of Daoism and Confucianism; it also did not start as a Buddhist temple. Traditional Buddhist temples in China built before the Qing Dynasty tend to feature courtyards surrounded by buildings that are arranged along a central axis; they have a symmetrical layout.[246] The Chunyang Guan Temple has a more complex layout that integrates courtyards, pavilions, and gardens. The layout is geometrically symmetrical, with an even number of buildings in a horizontal row and an odd number of buildings in a vertical row; its architecture demonstrates the unique allegorical and symbolic artistic techniques of China.[247] Like many buildings built in the Qing Dynasty, the architecture of the Chunyang Guan Temple is about symmetry and balance; the roofs are curved, and vibrant colors are used to decorate the buildings.[248] The blending of Chinese and Western styles in the temple architecture occurred because of the rise in imperialist power and foreign capitalism in the late Qing Dynasty.[249] The influence of Manchurian and Western elements, such as bold ornamentation and military symbolism, can be observed in the architectural design. Since its construction continued in modern China after the end of the Qing Dynasty, more durable modern materials were used in combination with timber.

The transformation of the temple occurred in different time periods, and the identity and function of the temple were impacted by those transformations. During the Qing Dynasty, the

[246] Zhixia Qiao, Ancient Chinese Temples, (Beijing: China Business Press, 2015).
[247] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[248] Sicheng Liang, 梁思成 and Huiyin Lin 林徽因, History of Chinese Architecture, 中国建筑史 The Compilation and Translation Bureau of the Chinese Academy of Sciences, 1954.
[249] Zhizhong Dai, and Yuzhen Yang, "Southwest Chinese Regional Architectural Culture," Wuhan: Hubei Education Press, 2003.

temple was a religious site for diverse religious practices, but after the end of the Qing Dynasty, the focus shifted to Confucianism, and during the war between China and Japan, the temple was converted into an orphanage and later into a school. When the Cultural Revolution started in China in 1966, religious practices were suppressed, and many temples suffered heavy damage; the goal was to destroy old traditions and old culture, and as a result, many temples, artworks, and monuments were damaged.[250] The Chunyang Guan Temple was no exception; the temple was partially destroyed due to the revolution.

The protection of the temple began in the mid-twentieth century. In 1966, when the Cultural Revolution started, the Chunyang Guan Temple was severely damaged; all original statues completely destroyed and the gardens partially damaged. The property rights of the temple were transferred to the Chengchang Military Depot of the Chengdu Military Region in 1973 but were returned to the local government of Xinjin in 1985 to support local tourism and protect cultural heritage.[251] In the 1980s, the temple was not restored to its religious order but was turned into a museum.[252]

The temple gained recognition for its historical and cultural value in the 1990s, and efforts were made to restore its architectural structure and design. In 1991, the Sichuan Provincial Government listed the temple as a cultural relics protection unit. The renovation process focused on rebuilding the damaged components and mitigating potential risks while

[250] Stefanie Lamb, "Introduction to the Cultural Revolution," Stanford Program on International and Cross-cultural Education, (2005).
[251] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[252] Elena Valussi, "The Chunyang guan and the multivocality of a religious space," Mapping Religious Diversity in Modern Sichuan, updated 2021, https://sichuanreligions.com/the-chunyang-guan-%E7%B4%94%E9%99%BD%E8%A7%80-and-the-multivocality-of-a-religious-space/.

maintaining the authentic appearance of the temple.[253] Although the temple is no longer a place of worship, it serves as a cultural hub for visitors who can engage with different religious philosophies.[254]

The temple has experienced significant changes throughout its history, and it has made a transition from a religious site to a secular space where non-religious activities are performed. Visitors are more interested in non-religious and cultural activities and less attracted to religious statues and sculptures.[255] The temple faces challenges in attracting visitors and maintaining relevance in rapidly changing Chinese society. It is similar to the issue faced by the Guanyin Temple, but the Chunyang Guan Temple has the advantage of being a secular space that can appeal to individuals who do not associate with any religion. Still, the temple remains an integral part of the rich cultural heritage of China.

Restoration Process

Unlike the Guanyin Temple, the Chunyang Guan Temple has been provided adequate protection, so it has undergone successful restoration and stands as an example of well-protected cultural heritage. Due to consistent and adequate protection, the damage to the structure of the temple has been minimized, making the restoration process less complicated than for the Guanyin Temple. The Chunyang Guan Temple has not only rich history and unique architecture but also religious diversity, so it attracted the attention of the local government and community, and the restoration process was initiated by the local government. When the restoration process

[253] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.
[254] Valussi, "The Chunyang guan and the multivocality of a religious space."
[255] Valussi, "The Chunyang guan and the multivocality of a religious space."

started in the 1980s, the level of damage to some of the buildings had been severe, and conservationists found it difficult to mitigate the risks and threats facing parts of the temple without modifying its authenticity.[256]

Figure 3.3: Traditional craftsmanship. Photo by Author.

[256] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 “Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example.”基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.

The temple has been recognized and provided with protection, so the architectural features of the temple remain true to their original design. In 1985, the original scale and form of the buildings of the temple were successfully restored under the oversight of the Cultural Relics Management Office, and until 1988, repair and rebuilding of the temple was carried out.[257] In 1991, the Sichuan Provincial Government announced that the temple would be protected and managed as cultural heritage because of the involvement of the local community as they frequented the temple and wanted to restore it.[258]

The temple was provided protected status, and restoration was carried out on a large scale. Parts of the temple had suffered extensive damage, so there were serious safety hazards; one of the main causes of damage was the environment, as there was water seepage on the roof wall, rotten splitting of wood frames, wall cracking and peeling, termite infestation, and deformation of doors and windows.[259] The restoration process was aimed at ensuring the stabilization of the temple so that there would be no hindrance to future restoration efforts.

The repair work involved reinforcement of the foundation, replacement of rotten wood frames, renovation of roofing, and rectification of exterior eaves decoration.[260] There was a combination of traditional and modern methods so that the authenticity of the traditional architecture could be maintained, as shown in Figure 3.3. Conservationists and artisans worked together to ensure that the two methods blended together. For example, unsaturated polymer

[257] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[258] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[259] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.
[260] Dan, 但昌荣 and Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."

resin was used for grouting reinforcement to deal with decayed wooden structures and roof waterproofing was done by either applying protection liquid on tiles or adding protective layers on the roof panel.[261] Although the goal was to maintain the original form and design, there were some heavily damaged components that needed to be modified to preserve them. For example, steel reinforcement was used to support the weakened components, such as the cracked walls and unstable framework, and although this method did not cause any harm to the structure, it did have some impact on the appearance.[262]

[261] Dan, 但昌荣 and Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."
[262] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.

Figure 3.4: Example of traditional temple decorative components. Photo by Author.

Most of the structural issues were addressed during the restoration process. Advanced materials were used in reinforcement to help the temple withstand environmental stresses, and decayed and damaged beams and frames were repaired and replaced without altering their appearance. Traditional craftsmanship, as shown in Figure 3.4, was heavily emphasized in the restoration process. The intricate woodwork and carvings were restored with the help of skilled artisans who were trained in ancient techniques. The repair of woodwork, stonework, and decorative elements was done using traditional methods. For example, in the process of repainting the wood structures, the wood surface was first scrubbed using alkali water and

thoroughly washed with water, and then earth paint was used to repaint the surface.[263] Materials that were compatible with the original wood were selected for restoration.

The Chungyang Guan Temple was constructed using the traditional method of mortise and tenon joinery, which made the temple structure flexible.[264] The weakened joints were renovated by increasing their cross-section so that compressive and shear resistance capacity could be improved.[265] The longevity of the Chunyang Guan Temple can be credited to the mortise and tenon method used in its construction, which is also the case with the Guanyin Temple.

Another important aspect of the restoration of the Chunyang Guan Temple was the emphasis placed on decorative elements of the temple, such as murals and sculptures. The temple houses several murals and paintings that depict stories of culture and religion. For example, in the galleries surrounding the Dazhong Pavillion and Zhixiao Pavillion, there are stone-carved picture scrolls related to Daoist values and virtues; these relics promote patriotism and traditional values.[266] The wood carvings and decorative paintings were repaired using soil paint treatment and reinforcement agents.[267] Traditional pigments and materials were used to ensure that the repair looked authentic. Conservationists depended on historical documentation to conduct the

[263] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.
[264] Xinyu Bai, "Scientific wisdom in ancient Chinese architecture," China Academic Journal Electronic Publishing House, 2024.
[265] Dan, 但昌荣 and Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."
[266] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[267] Dan, 但昌荣 and Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."

restoration process, which helped them avoid unwanted modifications to the original decorative elements.

The restoration of the Chungyang Guan Temple took place over an extended period. It started in 1985 and was completed in 2009. Between 1985 and 1988, severely damaged buildings were demolished and rebuilt, and structural components of important pavilions and halls were repaired. Between 1991 and 2000, extensive repair of the individual pavilions and halls was conducted, starting with the Dazhong Pavillion in 1991 and ending with the Yellow Crane Tower in 2000. Between 2001 and 2009, many of the original statues and shrines were restored to their original form and design, and potential risks were addressed.[268] The restoration process was possible because of the active involvement of the local government and support from the local community.

If the government had not granted protected status to the temple, it is highly likely that the temple would not have survived or its restoration would not have been so easy. Without government's support, the temple would have received funding for restoration, so the designation was extremely important. The Guanyin Temple can be taken as an example; due to a lack of consistent repair, the temple was severely damaged and now exists in a diminished state. On the contrary, the Chunyang Guan Temple has been restored to its original form and design because of the support from the people and the government. Therefore, the role of the government in the restoration of cultural relics cannot be overlooked. The Chunyang Guan Temple has been preserved in a way that blends authenticity with modernization. The blending of modern and traditional methods has enhanced the strength and durability of the structure of the temple.

[268] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.

Conservation Approach

The conservation approach for the Chunyang Guan Temple aligns with the guiding principles of the conservation of heritage sites proposed by the Chinese government. Conservationists focused on repairing the damage and mitigating potential risks and threats. They adhered to the guiding principles, limited the intervention as much as possible, improved the repair technology during the construction, and used materials that were compatible with the materials used in the original construction, as shown in Figure 3.5.[269] The most important aspect of the conservation approach was the strict adherence to the original architectural design.

Conservation efforts were designed in accordance with the complex history of the temple. The complete layout of the temple was produced through historical documentation and site surveys. The restoration plan was designed considering the historical evolution of the temple, characteristics of the temple, natural conditions of the site, and assessment of methods and materials used in the original construction. The restoration team had to study the site and all available records to understand the design and framework so that they could renovate without too many modifications.[270] Some of the important principles used in the restoration were maintaining the temple's original appearance, ensuring minimum intervention to the structure and the surrounding environment, using the original construction process and compatible raw materials, and adopting advanced technology to maintain quality.[271]

[269] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.
[270] Dan, 但昌荣 and Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."
[271] Dan, 但昌荣 and Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."

Figure 3.5: Using material compatible with original construction materials. Photo by Author.

The temple was affected by the Sichuan Earthquake in 2008, which damaged some structures such as the prayer halls and monk residential buildings.[272] All these issues were carefully considered while designing the restoration plan for the temple after the earthquake. Although the traditional wooden frame system initially made the temple resistant to earthquakes, the long-term disrepair had weakened the frame.[273] In addition, the wood used in the original construction was pine, which is susceptible to insect infestation.[274]

It was equally important to use materials that matched the timber used in the original construction. The materials had to be carefully selected for the restoration process. Timber is an

[272] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[273] Xiandong Zhu, and Tongle Zhang, "On the Seismic Technology Characteristics of Chinese Traditional Wood Structures," Mountain West Jian Build Shanxi Architecture 32, No. 14 (2006).
[274] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.

integral component of traditional architecture in China, but it is now considered a scarce material,[275] so conservationists have to use locally sourced, similar wood. In the case of Chunyang Guan Temple, most of the wood components were affected by decay and infestation, so the conservationist planned to replace and repair the affected parts by using similar wood materials.[276] The appearance and properties of the new materials must match with the original materials so that new additions can easily blend with the existing structure, maintaining the temple's visual aesthetics.

Figure 3.6: Traditional construction techniques. Photo by Author.

[275] Jenny Richards, and Peter Brimblecombe, "Moisture as a Driver of Long-Term Threats to Timber Heritage–Part I: Changing Heritage Climatology," Heritage 5, No. 3(2022).
[276] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.

As shown in Figure 3.6, traditional craftsmanship was also emphasized in the conservation approach because the original structure of the temple was created using traditional techniques, but the restoration team effectively combined traditional and modern methods. The mortise and tenon joinery used in the Chunyang Guan Temple allowed the wooden components to expand and contract in response to seasonal changes, and during seismic activities, the shock was absorbed by the wood frame.[277] Using modern fasteners instead of mortise and tenon joints would risk the safety of the structure because the properties of wood may not align with those of other materials. Therefore, the conservationists avoided the use of modern fasteners and employed the traditional joinery method. The modern techniques cannot replicate the authenticity of the traditional methods, but this temple shows that the two methods can be blended.

Comparative Analysis of Restoration: Guanyin Temple vs. Chunyang Guan Temple

The Guanyin Temple and Chunyang Guan Temple differ in many aspects, but there are some similarities. The historical evolution of both temples has been complex, and their architectural design and form have been impacted by social and environmental conditions. While the Guanyin Temple is an example of unprotected cultural heritage, the Chunyang Guan Temple is an example of well-protected cultural heritage. The Guanyin Temple was built before the Chunyang Temple and suffered severe damage but was not provided protection, whereas the

[277] Yefan Wu, "Mortise and tenon: Wisdom is hidden between the concave and convex," China Academic Journal Electronic Publishing House, (2024).

Chunyang Guan Temple was granted protection and was restored to its original form by the active involvement of the local government.

Time of Construction and Restoration

Since the Guanyin Temple and the Chunyang Guan Temple were constructed in different time periods, their restoration timelines and processes differ significantly. The Guanyin Temple is an example of a traditional Buddhist temple, while the Chunyang Guan Temple is an example of a modern secular temple. The Chunyang Guan Temple was built almost 700 years later than the Guanyin Temple, and it honors not only Buddhism but also Confucianism and Daoism.

The Chunyang Guan Temple was able to adapt to different social conditions over time due to its representation of different religions. The temple is no longer a place of worship but has become a cultural site for tourism and learning. The architecture of the temple has traditional as well as modern influences. Unlike the Guanyin Temple, the Chunyang Guan Temple underwent a significant transformation from a temple to a cultural hub, which might have contributed to its survival.

Extent of Damage

The Guanyin Temple had suffered more damage than the Chunyang Guan Temple. Due to the war during the late Southern Song Dynasty, the temple was severely damaged, but it was not adequately repaired, and then in the late Ming Dynasty, it was again destroyed because of the attack by Zhang Xianzhong.[278] The temple lost many of its original buildings, and only a few buildings exist now in the temple complex. In addition to wars, the temple has also been

[278] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.

impacted by the environment. Since it is made of timber and is located deep in the mountains, it faces issues such as decay, rotting, and fungal attacks.[279] The Chunyang Guan Temple has also experienced deterioration in the past. During the Cultural Revolution, the temple was damaged, and in 2008, there was some damage due to the earthquake.[280] Similarly, the temple has also been affected by environmental factors, such as insect infestation.[281] However, most of the temple buildings are preserved.

Levels of Protection and Types of Use

The two temples have different levels of protection. The Guanyin Temple did not have consistent protection, which led to severe long-term damage. When it was destroyed in the Southern Song Dynasty, it was largely neglected, and after the attack from Zhang Xianzhong, much of the repair work was done by monks in the Ming and Qing dynasties.[282] The temple was not provided adequate protection until the 1950s.The Chunyang Guan Temple has had better and more consistent protection. It became popular because of its association with Daoism, and its construction continued in modern China due to the involvement of the local government.

The restoration of the Guanyin Temple was much more complicated and challenging than that of the Chunyang Guan Temple because the Guanyin Temple had not received adequate repair for centuries and had lost many of its buildings and structures. The Guanyin Temple exists now as a traditional Buddhist temple and has cultural and historical significance, but restoration

[279] Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple."
[280] Sichuan Provincial Cultural Relics Administration, 四川省文物管理局 "History of the Chunyang Temple,"纯阳观历史.
[281] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.
[282] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.

efforts have dwindled due to the lack of public interest in and support for Buddhism. On the contrary, the Chunyang Guan Temple has been transformed into a museum and a secular space, which attracts visitors and supports restoration efforts; those visitors are more interested in non-religious activities.[283]

Much of the original structures of the Chunyang Guan Temple have been preserved because of consistent protection. The opposite is true for the Guanyin Temple; it exists in a diminished state because most of its structures are lost due to inadequate protection. The restoration timeline for the Chunyang Guan Temple has been somewhat straightforward, but in the case of the Guanyin Temple, restoration efforts have been limited, and the process has been more fragmented. Since historical records of the Guanyin Temple are limited, its restoration has been difficult. The Chunyang Guan Temple was built much later, so there are adequate historical records that can be used to conduct a successful restoration. The two temples are also perceived differently by the public; the Guanyin Temple is just a Buddhist temple, but the Chunyang Guan Temple is a cultural hub. In the rapidly changing Chinese society, people are distancing themselves from religion, so they may prefer and support the Chunyang Guan Temple.

Scarcity of Timber

One of the main technical problems in the restoration of both temples was sourcing appropriate raw materials, especially timber. In the case of the Guanyin Temple, the wooden structures were severely damaged and needed to be replaced, but finding the right species of timber was extremely difficult. Figure 3.7 shows one of the damaged paintings of the Guanyin Temple, and Figure 3.8 shows the restored mural of the temple. The wooden structures that could

[283] Elena Valussi, "The Chunyang guan and the multivocality of a religious space," Mapping Religious Diversity in Modern Sichuan, updated 2021, https://sichuanreligions.com/the-chunyang-guan-%E7%B4%94%E9%99%BD%E8%A7%80-and-the-multivocality-of-a-religious-space/.

not be repaired were replaced with similar species of wood, and large wood frames were not modified.[284] The Chunyang Guan Temple also suffered damage due to environmental factors, such as termite infestation; the damaged wood components were repaired by cleaning and painting them, and weakened components were reinforced, as shown in Figure 3.9.[285] In both cases, finding suitable timber to replace the damaged components was difficult because of environmental regulations to prevent deforestation. If the right wood were not used to replace the damaged components, it would sabotage the whole structure. Since the extent of damage to the Guanyin Temple was greater, it needed extensive repair work that would require more wood.

[284] Xiaoqing Zhu, 朱晓青"Study on the Architecture of Xinjin Guanyin Temple," 新津观音寺建筑研究 Master's thesis, Southwest Jiaotong University, 2023.
[285] Changrong Dan, 但昌荣 and Yan Bin. 颜斌 "Practice Exploration of New Technology and New Material Based on Cultural Relics–Take the Provincial Insurance Unit Pure Yangguan Repairing Project as an Example."基于文物建筑修缮新工艺新材料的实践探索——以省保单位纯阳观修缮工程为例.

Figure 3.7: Damaged paintings of Guanyin Temple. Photo by Author.

Figure 3.8: Restored mural of Guanyin Temple. Image source: Chengdu Xinjin Culture, Sports, and Tourism Bureau.

Figure 3.9: Damage due to termite infestation at Chunyang Guan. Photo by Dan Changrong.

Replicating Ancient Techniques

Another shared challenge was replicating ancient techniques. Both temples were built using traditional construction techniques that are not widely used in modern times. Figure 3.10 shows the application of the mortise and tenon joint method in repair of the Chunyang Guan Temple. The difficulties in procuring suitable raw materials and the lack of traditional craftsmanship created hurdles for the restoration process of the two temples. The restoration of cultural and historical sites like the Guanyin Temple and Chunyang Guan Temple is difficult. Without suitable raw materials and traditional construction skills, the restoration process cannot be successfully implemented.

Figure 3.10: Repair of mortise and tenon joints at Chunyang Guan. Photo by Author.

Social and Cultural Impact

The Guanyin Temple and the Chunyang Guan Temple are among the important cultural heritage sites in China, and their restorations represented significant cultural and historical milestones. Both temples have witnessed important historical events and endured damage over time, but both still stand as a testament to the historical evolution of China. The restoration of the Guanyin Temple is significant because it houses some of the most exquisite murals and sculptures from the Ming Dynasty, and the Pilu Hall and Guanyin Hall are precious physical remains of the Ming architecture in Chengdu, where timber structures from the Ming Dynasty are particularly rare.[286] The restoration of the Chunyang Guan Temple is equally remarkable because its main buildings, Dazhong Pavilion and Zhixiao Pavilion, are the largest brick-and-wood pavilions in the Sichuan Province, and it is considered the first Confucian academy of loyalty and filial piety.[287]

These two temples are reflections of the grandeur of the past dynasties. Both temples were built using locally sourced wood, and ancient architecture focused on maintaining harmony with nature and connection to the earth. By protecting these temples, traditional building practices that are at risk of being lost can be revived.

[286] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple,"观音寺的历史与壁画.
[287] Xinjin Historical and Cultural Materials, 新津历史文化资料"The History and Murals of Guanyin Temple."

Chapter 4: The Importance of Proper Restoration of Historic Temples

Understanding Architectural History and Religious Culture in Restoration

Ancient wooden temples were indeed built for religious purposes, but their significance extends beyond religiosity because they embody the rich architectural and cultural heritage of ancient China. They are important historical monuments. They act as critical links to the past, as they reflect the artistic, societal, and spiritual values of the periods in which they were constructed. Ancient temples and monuments that were damaged and deteriorated in the past due to issues such as wars, long-term disrepair, environmental factors, and social upheavals deserve to be preserved and restored because they represent the history and culture of the region and the community. These temples are architectural structures that reflect China's traditional craftsmanship, but more importantly, they serve as symbols of spirituality and history.[288] There are thousands of ancient temples all over China, and the government has been working on their restoration. However, there are still many temples that are difficult to restore because of severe or long-term damage.

Ancient temples are not just places of worship; they also serve as educational spaces where people can learn about religion, culture, and traditional architecture. Like the Guanyin Temple and the Chunyang Guan Temple, many ancient temples have undergone a lot of changes throughout their history; their architecture exhibits the influence of different dynasties.

[288] Xiangbin He, "The Value and Protection of Cultural Heritage of Religious Architecture," *China National Knowledge Network*, 38.

Culture can be considered as the socialization of human beings, and the change of culture is the evolution of the value system; architectural heritage is an important link to cultural identity, as culture blends into people's lives and exerts influence on the construction of heritage.[289] For example, during the Tang Dynasty, Zen Buddhism flourished and achieved a dominant position, which also impacted the architecture of the Buddhist temples; as a result, the pagoda style was replaced by the new form of Buddhist Hall influenced by Zen Buddhism.[290] By studying these ancient temples, it is possible to learn about not only how different dynasties had different architectural styles but also how those styles were influenced by dominant culture.

Figure 4.1: Thousand-hands Guanyin of the Dabei Pavilion. Photo by Author.

[289] Yingnan Liu, "Research on the Interpretation System of Chinese Architectural Heritage Culture–Constructing a New Development Path of Urban Cultural System," China Central Academy of Fine Arts, 2020.
[290] Yanqing Gao, "Chinese Buddhist Monastery Architecture Historical Change," Mudanjiang Normal University.

One of the most important components of human culture is ancient architecture. Ancient temples of China reflect the highest level of architectural culture, as they embody the wisdom and creative spirit of the Chinese people; they show the long history and splendid culture of China.[291] These temples and religious structures are, therefore, listed as world cultural heritage sites. They serve as educational spaces for learning about these important religions that have shaped Chinese society over thousands of years.

Another example of a successfully restored temple is the Dabei Pavilion at Baoding Mountain in Dazu, which houses the thousand-hands Guanyin, as shown in Figure 4.1. This temple was restored using the principle of "repair the old as it is," which means that the destroyed old structures should be remade using materials similar to original materials so that historical traces can be maintained; many components of this temple, such as doors, windows, and wooden boards were remade, and then methods, like carbonizing and inking, were used to give them an authentic look.[292] The restoration process of this temple shows that innovative techniques can be used in combination with traditional materials and craftsmanship.

Lessons from Restoration Failures: Cultural Disregard

Improper or failed restoration is often due to a lack of understanding of the cultural and religious context of historic wooden temples. If the restoration process is initiated without first analyzing and studying the available records regarding the construction of the structure, it is highly likely that the restoration will fail. In China, the restoration of ancient temples must not

[291] Xiangbin He, "The Value and Protection of Cultural Heritage of Religious Architecture," China National Knowledge Network, 38.
[292] Chengdu Ruoshan. 但昌荣 "Record the restoration of the Thousand-Hands Guanyin Hall (Dabei Pavilion) at Baoding Mountain in Dazu, and let you know about the restoration of cultural relics." 记大足宝顶山千手观音殿（大悲阁）修缮,带你认识文物修缮. https://www.xcar.com.cn/bbs/viewthread.php?tid=96263821&page=1.

diminish their historical and cultural integrity. Using modern materials that do not align with original materials could create structural problems and also clash with traditional aesthetics.

As shown in Figure 4.2, an example of an unsuccessful restoration is the Buddha statue in the Anyue Grottoes of Sichuan. The statue was painted and dressed in red and green fabric, which completely degraded the original shape and patterns of the statue, so it was heavily scrutinized by the Chinese public.[293] The restoration process was proposed and supported by local villagers, who had little knowledge of cultural heritage conservation; the statue was originally carved out of rock and was not painted.[294] This restoration did not pay attention to cultural significance and changed the original aesthetics of the statue. This shows a lack of cultural understanding and ignorance toward traditional craftsmanship on the part of those who were involved in the restoration process.

[293] Beijing Daily 北京日报, "The Buddhist statues in the Anyue Grottoes of Sichuan Province were subjected to "earthy restoration", with high saturation making the original Buddha statues "come down to earth instantly," 《四川安岳石窟佛像"返璞归真" 高饱和度让佛像"瞬间接地气》"

[294] Beijing Daily 北京日报, "The Buddhist statues in the Anyue Grottoes of Sichuan Province were subjected to "earthy restoration", with high saturation making the original Buddha statues "come down to earth instantly," 《四川安岳石窟佛像"返璞归真" 高饱和度让佛像"瞬间接地气》"

Figure 4.2: Failed restoration of the Buddha statue in the Anyue Grottoes of Sichuan. Image source: Beijing Daily.

This failed restoration damaged the historical and cultural integrity of the temple. It goes against the guiding principles of restoration and conservation of cultural heritage set by the Chinese government. The main differences between successful and unsuccessful restoration are the level of regard for the ancient structures, the extent of research and analysis of original construction methods and materials, the understanding of cultural and historical significance of the structures, and the ability to combine modern methods and traditional methods. Failed restoration of ancient temples can teach conservationists and the public that the restoration of religious buildings needs to maintain their original historical appearance and cultural characteristics and that the traditional craftsmanship should be used in combination with modern technology during the restoration process. It is possible to use modern technology to improve the

efficiency and effectiveness of restoration without damaging the original appearance, as in the case of the Dabei Pavilion in Dazu.

Government Initiatives to Promote Cultural Heritage Through Restoration

The Chinese government has increasingly focused on conserving and promoting historical and cultural heritage. Some of the important strategies and policies implemented by the government are funding for restoration projects and public awareness campaigns. Substantial resources are allocated by the government to restoration projects that employ traditional methods, which helps restore historical sites and also ensure the continuation of ancient craftsmanship techniques. The Chinese government enacted the Cultural Relics Protection Law in 1982, and it is the primary legislation for protecting cultural heritage; this law provides a framework for classifying, registering, managing, protecting, and restoring cultural relics.[295] The State Administration of Cultural Heritage is responsible for designating important temples as "Major Historical and Cultural Sites Protected at the National Level," and this designation provides increased protection and funding for restoration and conservation efforts.[296] At the same time, the government has also invested in efforts aimed at promoting cultural and historical importance of cultural heritage sites to the public so that they will develop a sense of national pride and cultural identity, which may inspire them to protect their cultural heritage. Since 2006, Chinese Cultural Heritage Day has been held on the second Saturday of June every year to raise public awareness about cultural heritage protection and promote Chinese culture.[297]

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[295] Zhengxin Huo, "Revised cultural relics protection law provides strong legislative support for recovery, return of lost treasures," *Global Times*, 10 November, 2023, https://www.globaltimes.cn/page/202411/1322794.shtml

[296] The State Council of the People's Republic of China, "State Administration of Culture Heritage," updated 23 September, 2014, https://english.www.gov.cn/state_council/2014/10/06/content_281474992893400.htm

[297] Yingxue Li and Yong Wu, "Cultural and Natural Heritage Day sheds light on Chinese civilization," *China Daily*, updated June 8, 2024, https://www.chinadaily.com.cn/a/202406/08/WS66641043a31082fc043cb9a6.html

In 2011, the Chinese government passed the Intangible Cultural Heritage Protection Law to provide a legal framework for protecting and promoting the country's intangible cultural heritage, including traditional skills and crafts.[298] The emphasis is on the integration of traditional craftsmanship in modern construction. Traditional woodworking techniques, such as mortise and tenon joinery, are being revived and applied in the construction of new temples. This not only supports the continuity of ancient skills but also reinforces the cultural heritage and authenticity of modern religious buildings.

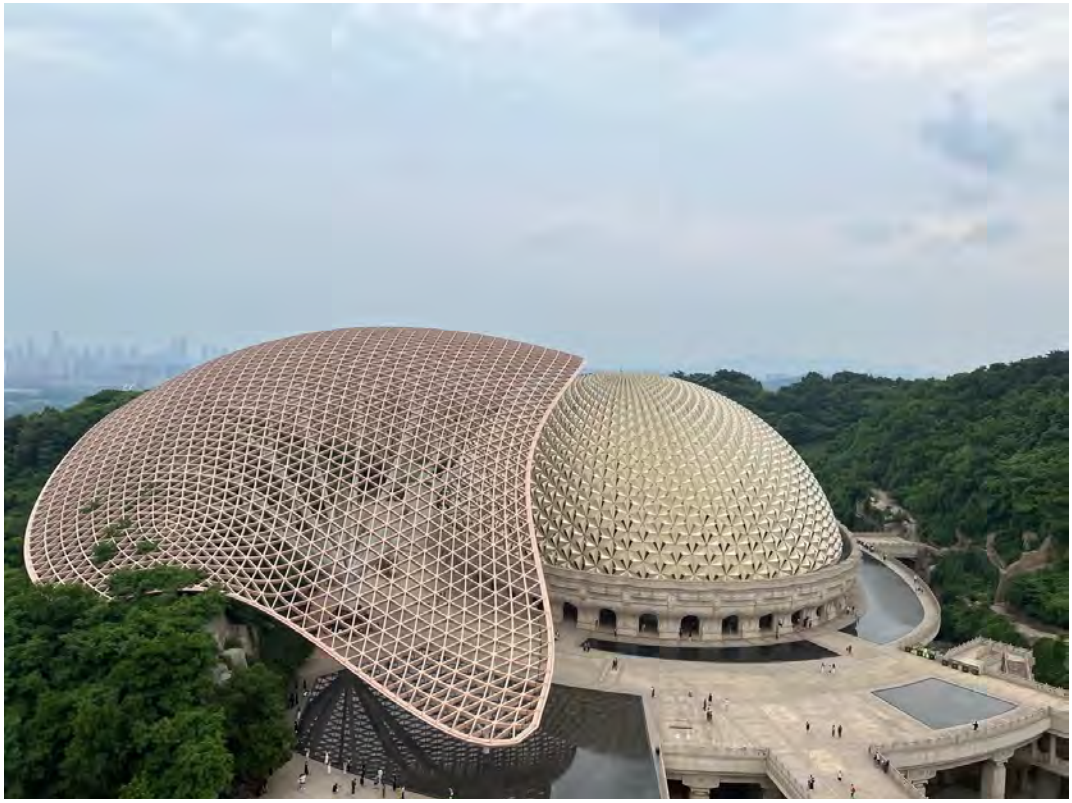

Figure 4.3: Outside the Nanjing Niushoushan Temple. Photo by Author.

An example of the perfect blend of traditional and modern construction methods is Niushoushan in Nanjing. It is one of the most important Buddhist cultural landmarks in Nanjing;

[298] The State Council of the People's Republic of China, "Intangible Cultural Heritage Law of the People's Republic of China," updated 20 August, 2014, https://english.www.gov.cn/archive/laws_regulations/2014/08/23/content_281474982987416.htm

as shown in Figure 4.3 and 4.4, it combines traditional aesthetics of Buddhist architecture with unique and modern architectural design, providing a unique cultural experience to the public.[299] It shows how modern methods can enhance the beauty of traditional structures without modifying their cultural integrity. This place is extremely popular among not only domestic visitors but also foreign tourists.

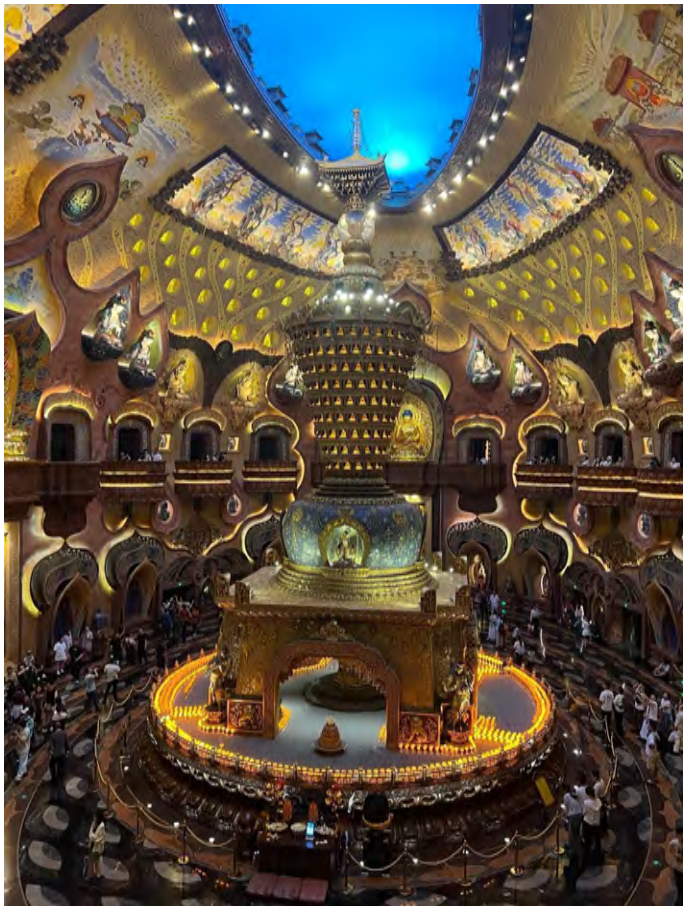

Figure 4.4: Inside the Nanjing Niushoushan Temple. Photo by Author.

[299] China Discovery, "Niushoushan - Buddhism-themed Park to Refresh Your Eyes and Mind," https://www.chinadiscovery.com/jiangsu/nanjing/niushoushan.html

Significance of Religious and Historical Context in Restoration

Restoring ancient temples is a process of maintaining historical accuracy because the original design is not modified. This promotes the importance of cultural heritage and motivates conservationists to emphasize history in modern architectural practices. Ancient temples are complex and immovable cultural relics that are composed of different materials and have different value elements, so their restoration must focus on maintaining the function and image of the structure, using the original materials and craftsmanship, and limiting the intervention as much as possible.[300] Ancient temples used traditional yet sophisticated construction technology that is now at risk of being lost. For example, during the Song Dynasty, the size and architectural pattern of Buddhist temples were so grand and magnificent that they were even compared to the Imperial Palace; these temples had several halls, pavilions, and pagodas built in accordance with the landscape and decorated with intricate carvings and sculptures.[301] The beauty of these temples is unparalleled and cannot be completely recreated using modern construction techniques.

Ancient temples are often located in the mountains, and ancient architects and builders used the natural landscape to create a strong spiritual atmosphere, which is both relaxing and transcendent.[302] Temples can be considered as the palace of gods in the human world, so ancient temples were designed to depict the paradise of the gods, with magnificent scenery, exquisite gardens, and marvelous pools; the natural landscape was combined with the architecture because the goal was not just to meet the needs of religious activities but also to meet the needs of

[300] Hua Sun, "A preliminary discussion on the protection of architectural heritage – focusing on the protection and restoration of timber-framed buildings," *Journal of the Palace Museum*, no. 10 (2024).
[301] Jianchao Xi, Quansheng Ge, Shengkui Cheng, and Zengrang Xu, "Ancient Buddhist Tourism Development and its Enlightenment," *Human Geography* 21, no. 4 (2006): 70.
[302] Yinzhi Yuan, "A Brief Discussion on Buddhist Tourism Resources and Development," (2004): 30.

sightseeing and cultural exchange.[303] These temples are visually stunning and attract the attention of believers and casual visitors. The restoration process must be conducted with caution so that the original design and form of the temples are not altered. In the restoration process of the Chunyang Guan Temple, modern methods were combined with traditional methods to ensure that the interventions were minimal; as a result, the original appearance of the temple was successfully restored.

The construction methods and techniques used in the past to build temples will be lost if they are not continued. Modern architecture very much focuses on efficiency and largely neglects traditional values of harmony, spirituality, and growth. Modern construction methods can alter the original form of a temple, but conservationists can find a way to maintain a balance between modern techniques and ancient methods. In this way, the historical accuracy of the temples can be preserved.

Ancient temples are more than just religious places; they represent significant historical periods, traditional architectural styles, and valuable cultural practices. Since there are a large number of ancient temples, the Chinese government is doing its best to protect them, but it has been difficult to provide the same level of protection to all the temples. The case studies of the Guanyin Temple and Chunyang Guan Temple illustrate this issue. Conservation of ancient timber buildings is different from that of other types of buildings because of the use of timber, which is scarce now, and traditional building techniques, which are not popular anymore. The Chinese government has provided guidelines on how to engage in conservation of cultural heritage as well as policies such as the Cultural Relics Protection Law and the Intangible Cultural Heritage Protection Law.

[303] Xi et al., "Ancient Buddhist Tourism Development and its Enlightenment."

More than 5,000 ancient temples have been listed as national cultural relic protection units by the Chinese government due to their historical and cultural significance. Their purpose is not limited to religious practice. Many temples, where monks used to live and engage in religious practices, were used for other purposes after the founding of modern China; they were renovated and turned into cultural spaces for learning history and culture.[304] The Chunyang Guan Temple can be used as an example in this context, as it was turned into a museum after the fall of the Qing Dynasty and the founding of modern China. The temple now provides visitors a closer look into the history of the Qing Dynasty and the historical events that took place after the fall of the dynasty. It teaches visitors about not only religion but also history and culture.

Chinese temples attract attention from international tourists. They help to promote Chinese culture to the rest of the world. International tourists visit ancient temples and help with the protection and maintenance of these temples. They can learn about Chinese history and appreciate ancient Chinese architecture by visiting these temples. Ancient Chinese architecture is unique and highly developed, which is reflected in the construction of ancient temples. This information can be conveyed to international tourists, which will help to highlight the sophistication of ancient Chinese architecture. Ancient temples in China are valuable sources of historical knowledge and traditional skills, and promoting them will further increase their appeal.

[304] Chao Zhang, "The Present Use of the Ancient Temple," Research on Heritages and Preservation (2018): 156.

Conclusion

Conservation of ancient temples is critical for maintaining cultural heritage and fostering community identity. Architectural heritage has not only historical and artistic value but also scientific and technical value; ancient temples bear witness to the change of society and time and reflect the aesthetics of the time period during which they were built, but their most fascinating aspect is the use of sophisticated construction technology and techniques.[305] Traditional skills are not commonly used in modern society, and younger people do not know about them. In order to revive these traditional skills, public awareness should be emphasized.

Ancient wooden temples are historically significant because they were built during past dynasties, reflect Chinese values and ideals, have witnessed centuries of historical events, and have grown integral to the Chinese built environment. They have also been affected by wars, social and political conflicts, and environmental factors. By conserving them, the history of the country can be conserved. However, it can be difficult to conserve these ancient wooden structures if they are severely damaged or traditional construction techniques are not used.[306] Modern building methods may be suitable for repairing ancient structures. Another issue is the increasing scarcity of timber as a building material. These issues can complicate conservation efforts. Ancient Buddhist temples are not just architectural structures; they are the embodiment of Buddhist values, so their restoration and conservation should utilize traditional wooden temple construction methods. The aesthetic value and the cultural significance embedded within these

[305] Tian Li, 李田 "Health Evaluation and Research of 20th Century Brick and Wood Architectural Heritage in Beijing," 北京 20 世纪砖木建筑遗产健康评估与研究 Master's Thesis, Beijing University of Technology, 北京工业大学硕士论文 2017.
[306] Li, 李田 "Health Evaluation and Research of 20th Century Brick and Wood Architectural Heritage in Beijing."

structures make them valuable cultural heritage, and they should be conserved to teach future generations about the history of China.

In recent years, Chinese people have lost interest in religion; temples and religious communities have become the target of criticism, as many people, especially young see these sites as a way of amassing wealth through faith, and ignorant people even insult religion on public media; for example, a Chinese television host working for CCTV named Bi Fujian openly humiliated Buddha on national television.[307] These incidents have caused great harm to religious communities, and it becomes more important to raise public awareness about religion so that such incidents can be avoided. According to the findings by the Pew Research Center, younger Chinese people are less likely to care about religion than older people, and they are more likely to visit a temple or shrine to pray for good fortune in school, health, or business, which is a superficial approach to religion.[308] This implies that younger generations may see temples as just places of worship that they can visit to receive good fortune.

Public involvement is vital to the restoration and conservation of these temples; social forces must be mobilized to ensure effective protection. Without active engagement, ancient temples are likely to face neglect, leading to their deterioration. In order to conserve and protect ancient temples, support from the community and local people is as important as governmental support. Without public engagement and support, ancient temples and religious sites will struggle to survive. The Guanyin Temple can be taken as an example. The temple suffered from long-term disrepair and lost much of its original grandeur due to inconsistent and inadequate restoration efforts. On the other hand, the Chunyang Guan Temple remained largely intact and

[307] Jianling Sun, and Linyan Pu, "The Relationship between Buddhist Culture and Economic Development in Contemporary China."
[308] "Religious change in China," Pew Research Center, effective August 30, 2023, https://www.pewresearch.org/religion/2023/08/30/religious-change-in-china/.

was provided adequate protection due to consistent support from the local community and the government. Protecting cultural and architectural heritage is both an individual and collective behavior that is largely based on an understanding of the unique and shared values of the heritage and, in accordance with the general principles of protection, taking appropriate human interventions to conserve the character and value of the heritage.[309]

In order to ensure consistent and adequate protection of these temples, the community should be involved and funding should be increased. The Research Institute of Buddhist Culture of China develops and implements programs, such as cultural experience trips and college lectures, to contribute to Buddhist cultural development and expanding cultural exchange.[310] Their objective is to instill appreciation for culture and ancient temples among younger generations. With a waning interest in religion, tourism can be critical to the sustenance of these temples. For example, the Chunyang Guan Temple's conversion into a museum allows visitors to engage in both religious and non-religious activities; this significantly supports funding for the temple's conservation and maintenance.

The public should be taught about ancient temples so they can understand how significant and relevant they are, which will encourage appreciation of these structures. Cultural heritage protection must attach great importance to the interpretation and dissemination of cultural heritage values; activities aimed at raising public awareness and enhancing public understanding of cultural heritage sites should be implemented, some of the existing methods include print and electronic publications, public lectures, educational programs, on-site and off-site facilities, and

[309] Hua Sun, "A preliminary discussion on the protection of architectural heritage – focusing on the protection and restoration of timber-framed buildings," *Journal of the Palace Museum*, no. 10 (2024).
[310] Institute of Chinese Buddhist Culture, "Chinese Buddhist Cultural Research Institute," 2023.

community activities.[311] Travel books, films, and TV shows can also contribute to increased public awareness. By promoting public awareness, public engagement with religious sites can be increased, which will motivate them to visit these sites.

Ancient temples attract both religious and non-religious visitors. In the case of religious visitors, these temples are places of worship; for example, Buddhists tend to travel to religious sites in different parts of the world, and they engage in religious purposes, such as pilgrimage, Buddhist culture experience, dharma seeking and spreading, and religious learning.[312] In this case, Buddhist tourists will engage with the temples and use local facilities and resources, which will support the local economy. There are more than 30,000 temples in China, and visitors may be more attracted to some temples and less interested in other temples. Factors that influence the appeal of a temple are maintenance, ease of access, and promotion.[313]

Ancient temples have received a large amount of donations from not only ordinary people but also wealthy merchants; for example, Wang Jialin donated one billion yuan for the renovation of the Da Bao En Temple in Jinling, Nanjing.[314] Donations from believers can be used to maintain the temple and invest in programs aimed at raising public awareness related to religion. Temple tourism often includes activities that may appeal to both religious and non-religious visitors. Those who are troubled by the issues of material life may be able to relieve their minds by engaging in those activities; one such activity is visiting temple gardens because they exist at the intersection between religion and recreation, helping to understand the role of

[311] Yingnan Liu, "Research on the Interpretation System of Chinese Architectural Heritage Culture–Constructing a New Development Path of Urban Cultural System," China Central Academy of Fine Arts, 2020.
[312] Yinzhi Yuan, "A Brief Discussion on Buddhist Tourism Resources and Development," (2004): 30.
[313] Jingwen Liang, Horos Chen, and Ruigang Chen, "Folk Temples and China's Religious Economy–Religious Managers Explore," (2010): 21-26.
[314] Jianling Sun, and Linyan Pu, "The Relationship between Buddhist Culture and Economic Development in Contemporary China."

religion in modern social culture and life.[315] These activities can motivate non-religious visitors to learn more about the temples. The more tourists visit ancient temples, the more money these temples make, which supports the local economy and community. Promotions are critical because people will not visit temples that they do not know about; they need to know why they should visit them. The recent release of the game *Black Myth: Wukong* attracted the attention of game lovers and enthusiasts around the world; due to the meticulous restoration of ancient Chinese-style buildings and temples in the game, the cultural tourism industry in China has become the focus of attention. The game features landscapes and temples of the Shanxi Province, due to which a large number of tourists have flocked to the region; the number of visitors to Shanxi soared by 50% and hotel bookings doubled in August from July in 2024.[316] This game increased tourism activities in the Shanxi Province. It shows how effective pop culture, mass media, and promotion can improve tourism and enhance economic activities.

This thesis focused more on the conservation approach of the Chinese government than the policies related to conservation. Future research may look into comparing China with another country in terms of temple conservation, which can help to understand how different and similar conservation methods are and what these countries can learn from each other. It is also recommended that conservation policies implemented in China be discussed in detail. The case studies of the Guanyin Temple and the Chunyang Guan Temple can be examined in more depth to understand how popularity leads to better conservation efforts. It is important to study this issue because it can help conservationists come up with better strategies.

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[315] Xiaoyun Dong, "Research on Temple Gardens and Planning Based on Tourism Development," Master's thesis, Huazhong University of Science and Technology, 2007.

[316] Alice Yan, "China's Black Myth frenzy: Wukong game sparks tourism surge at featured sites," *South China Morning Post*, August 28, 2024. https://www.scmp.com/news/people-culture/trending-china/article/3276060/chinas-black-myth-frenzy-wukong-game-sparks-tourism-surge-featured-sites.

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