

**Research Article** 

**Environmental Science and Climate Research** 

# The Evolution of Chinese Architecture in the 21st Century

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#### Abstract

With the opening of five ports in 1843, there was a collision of Chinese and Western architecture in terms of design ideas, concepts and styles. However, Chinese architecture in the 20th century introduced a large number of Western architectural styles. While nothing stands still, not even architectural design. In the 21st century, Chinese architecture has gradually evolved into a design concept based on Chinese traditional culture, which dominates the evolution of architectural forms. At the same time, with the global sustainable development and green ecological concepts, the combination of traditional culture and architectural design has formed a unique Chinese architectural style, showing a diversified development. This article will mainly explore the expression and integration of traditional culture in early Chinese architecture, as well as the new concepts of contemporary Chinese architecture in the 21st century.

the times.

#### **1. Introduction**

In the mid-19th century, as China gradually opened five treaty ports, Western building materials and technologies began to flow into the country. Initially, the structural technology brought by the West was mainly concentrated on masonry buildings, such as British classical, Renaissance or column buildings. From the early 20th century to the mid-20th century, domestic architecture showed a trend of diversified development in style and materials. During this period, European neoclassicism coexisted with traditional Chinese architectural styles, and reinforced concrete and building structures of more than five floors appeared. Buildings such as the Oriental Bank of China Building and the Shanghai General Association Building are more modern in appearance, while also retaining the charm of traditional Chinese culture. The architecture of this period witnessed the integration and innovation of Chinese and Western cultures. From 1925 to 1937, the modernist style of European and American "International Style" architecture was introduced into Shanghai, gradually replacing the simplified classical style and the Baroque architectural style that was integrated with commercial society. The buildings of this period were mainly high-rise buildings, such as the Sassoon Building and the Bank of China Building. These high-rise buildings not only meet the needs of business and residence, but also embody the simplicity and practicality of modernism in design and structure. In the 1950s, the combination of localized Soviet design and traditional Chinese style continued until the 1990s. Although Soviet-style classical architecture has gradually been replaced by the functionality required by the current era, it does not prevent the

aditional buildings, which refer to high-quality buildings that maximize building resource conservation and achieve harmonious coexistence such as between humans and nature during the life cycle of the building. General Sustainable concepts drive the development of Chinese

architecture. This article mainly follows the chronological order, and analyzes the future development of Chinese architecture under the concept of global sustainable development from architectural cases in the 21st century.

Sino-Soviet Friendship Building from being a witness and symbol of the era of Sino-Soviet friendship [1]. Therefore, the protection

and restoration of historical buildings have become a hot topic of

Turning to 21st century, it was an era of exchange and collision

between China and the West, and many architects and wonderful

architectural works emerged. New concept, such as green

## 2. Case Studies

Traditional Chinese architectural elements include horse-head walls, enclosed courtyards, quadrangles, vermilion gates, hollow flower windows, wood carvings, and flying eaves. These elements not only reflect the unique style of traditional Chinese architecture, but also contain rich cultural connotations. However, by the end of the 20th century, Chinese architecture was in an exploratory stage. Traditional architecture has evolved into the "big roof" form, and functionalists also have different opinions on architectural design. In the 21st century, Chinese architects' expression of architecture is not only reflected in the traditional style, but gradually they have their own ideas. In 2006, the Suzhou Museum, which was designed by I.M. Pei. It is a classic example of the combination of tradition and modernity. Decorative lines in white and gray are used to reduce the sense of weight of the building. The overall building materials use glass and concrete instead of traditional wood, which is an innovation.

The National Stadium (Bird's Nest) makes excellent use of new materials and new structures to show complex and exquisite aesthetics and mechanical properties. At the same time, it gives the building a display of traditional Chinese culture and symbolizes China's innovative ability in the field of architecture, becoming a new landmark in Beijing. In 2010, Shanghai, China held the 41st World Expo, which was also a profound reflection on architectural design. Many types of technologies, such as energy-saving and environmental protection technologies, ecologically sustainable technologies, new materials, etc., are integrated into the architectural design of the China Pavilion. This is a challenge for Chinese architectural design. For example, the building combines passive energy-saving measures such as selfshading, natural ventilation, and lighting, and active ecological energy-saving technologies such as solar roofs and ice storage technologies, to comprehensively improve the environmental awareness and technological content of the China Pavilion [2]. Turning to designed Galaxy SOHO based on the deconstructionist design concept. Its design is inspired by the Wind and Water flow in nature. They can maintain a streamlined shape from any angle and avoid large corners. The open design makes the whole space full of agility and vitality. The streamlined terraces and corridors are interspersed with each other, the spatial layout is reasonable, and the transition between various areas is natural and smooth, which not only meets the needs of commercial functions, but also fully considers the comfort experience of people. Sunlight shines into the huge atrium through the circular glass windows on the roof. The full use of natural light also reduces the use of lights in the building and reduces energy consumption [3]. The building integrates traditional Chinese cultural elements and modern architectural design. For example, drawing on the idea of Chinese courtyards, four elliptical buildings are enclosed to form a sunken square, which is also an important public space inside the building [3]. However, what is most special is that the building has skylights in each unit. These modules provide gentle light to the interiors of the four building units. This modular structure increases the surface area of the building complex. This structure increases the surface area of the building complex and exposes the interior of the building to more sunlight.

The design of Shanghai Tower embodies the perfect fusion of modernization and sustainability, showing the possibility of super high-rise buildings in the future, similar buildings include Canton Tower, Guangzhou. In the late 20th century, China's reform and opening up entered a climax, and economic development was greatly improved. Many areas in Shanghai have transformed from barren farmland to areas with rapid economic and commercial development [4]. On the one hand, the limited land in the city needs to meet people's demand for high-density buildings, which is a conflict between people and nature and the environment. On the other hand, with the fast-paced city life, people also need to find a trace of green close to nature in the cold concrete buildings. Gensler, the designer of the Shanghai Tower, combines traditional Chinese cultural elements while integrating urban development trends and modern design concepts into the building. The designer was inspired and inspired by the traditional element hutongs. Residential buildings are organized around the public open space in the middle. Similarly, in the Shanghai Tower, these communities are vertical, and each community has its own "sky garden" to promote interaction and create a sense of community. From the perspective of policy and urban development, the Shanghai Municipal Government requires that 30% of the site be green. This building not only meets this requirement, but also draws on the temples, pagodas and palaces in Chinese history in the landscape design of the site. This design is not only an intuitive embodiment of green buildings, but also a fusion of humanistic and social ideas. Stefano Boeri first proposed the vertical forest as an innovative urban greening design concept. Its main feature is to plant a large number of trees and plants on the building structure to form a green vegetation wall, thereby solving environmental problems such as air pollution, heat island effect and ecosystem destruction caused by urbanization. In 2022, China's first vertical forest complex "Huanggang Juran Home" was completed in Huanggang City, Hubei Province. Open and closed balconies integrate a large number of green plants into the interior. This design greatly reduces carbon emissions every year.

Looking around the world, Melbourne's Pixel Building is Australia's first carbon-neutral office building. The developer uses a low-carbon concrete called "Pixelcrete", which is mainly composed of industrial waste, recycled or regenerated materials, reducing the traditional cement content, thereby reducing carbon emissions and achieving carbon neutrality. Singapore has a natural advantage in developing vertical forest buildings, and Oasia Hotel Downtown is a representative practice in this field. The building has a mesh shell on the outside, which is covered with 21 different types of climbing plants, providing food and living space for birds and insects, and creating a unique ecological living experience for nearby urban residents. The Bahrain World Trade Center is located in Manama, the capital of the island nation of Bahrain. This building is also one of the first buildings in the world to have wind turbines built directly into the building structure, providing experience for the development of wind energy buildings in global cities.

As cities grow and high-rise buildings increase, Asia has become the center of high-rise buildings, while in Europe and the United States, they pay more attention to manufacturability and efficiency than building height [5]. The Al-Bahar towers in Abu Dhabi is an example of a building whose honeycomb-like appearance is computer-determined. The solar roof allows the building to dissipate heat and keep warm very well as the climate changes. The design saves a lot of electricity energy. On the one hand, houses have not undergone fundamental changes, architecture is traditional. On the other hand, architecture is innovative [5]. For example, France's ECO-house uses natural materials and innovative technologies to maximize energy savings and improve living comfort while causing minimal harm to the environment.

In summary, from a green and sustainable global perspective, architects prefer low-carbon buildings and people's experience inside buildings. This means the application of new materials and new structures. Different from the traditional roofs, beams and columns of Chinese architecture in the 20th century, architects in the 21st century are more inclined to integrate deep traditional cultural concepts into architectural design. At the same time, buildings are combined with urban planning to create landmark buildings. More importantly, the integration of Chinese and Western cultures has become more frequent, and Chinese designers are constantly thinking and combining advanced Western concepts to integrate them into architectural design.

## **3. Discussion**

Rather than attracting renowned overseas architects and multinational design firms, the organizers of the China Pavilion design competition called for participation from architects of Chinese descent around the world. This unconventional eligibility criteria stems from an industry paradox. During the modernization boom of the past few decades, domestic architects have not yet successfully translated the country's rich architectural heritage into an easily recognizable modern architectural language. The process of globalization has also caused a collision between Chinese and Western cultures, including architecture. Many architects and critics oppose the excessive Westernization of domestic architectural design, believing that China has actually become a test site for foreign architects to try new design techniques and materials. Of course, due to different cultural backgrounds, the works of these architects cannot always integrate local characteristics, and the designed buildings seem a little mediocre to Chinese people, both from an aesthetic and functional perspective. This has also inspired Chinese architects to think about how to combine regional culture with traditional characteristics in architecture.

From a vertical perspective, reviews the changes of the China Pavilion in eight historical events from the Philadelphia World Expo in 1876 to the Shanghai World Expo in 2010, China, over the past 134 years, showing two common features: traditional vocabulary and color selection [6]. The inspiration for these buildings comes from in-depth designs based on traditional Chinese culture. The choice of color reflects the Chinese preference for red. Through structural expression elements and gorgeous Chinese red, the implemented "dougong" scheme perfectly matches these two traditional attributes. As an innovative combination, this case sets a model for integrating traditional vocabulary into modern architecture. However, in terms of the safety of the building, pointed out the need to improve the seismic resistance index of the China Pavilion's building structure through earthquake resistance tests, and proposed improvement plans for weak points. Meanwhile, contemporary people's criticism and demand for Chinese architecture are also increasing [7]. The novel appearance of buildings is gradually unable to meet people's

needs for buildings. People are more concerned about how the functions of buildings, the design performance of internal spaces, and the creation of light behind the novel appearance of these buildings serve people. In the face of urban environments, how to combine urban renewal with future development. From the 19th century when Chinese architecture was mainly traditional, to the 21st century when architects constantly think about integrating tradition with modernity and creating great architectural works, this not only reflects the upgrade of design innovation, but also reflects the development of Chinese architectural design.

Academician He Jingtang, chief designer of the China Pavilion, also constantly thinks that how to integrate traditional Chinese culture, which has a long history, into architecture and express the essence and connotation of culture with specific images and design language is a huge challenge for future Chinese architecture. The design focuses more on symbolism rather than utilitarianism. However, in the reconstruction process after the Expo, the China Pavilion was considered to have a dual mission. Even with an aesthetic shell, single-purpose spaces are prone to underutilization after the Expo and combining dedicated and multifunctional spaces will provide greater flexibility. By supplementing the iconic roof with a fully functional platform, the possibility of the China Pavilion becoming a complete "useless thing" is minimized, as evidenced by its successful transformation after the Expo.

This case shows the possibility of a building achieving a good balance between form shaping and functional adaptability. Moreover, proposed that the spatial atmosphere in the building space is the key to the quality of the building and an important theme for conveying the sense of place experience [8]. However, there are few studies on the atmosphere factor. Therefore, for the 21st century, architectural design needs to be combined with philosophical thinking to explore the quality of the spatial atmosphere inside the building. At the same time, summarized the evolution of architecture in the 21st century. He divided the 21st century into three stages. The first stage was the early 21st century, emphasizing green buildings and sustainable bio-compatible design [9]. The second stage was the 2010s, when architecture was combined with cities and architecture was integrated into urban planning. The third stage is the present, combining bio-compatible design with human health and environmental sustainability. Biocompatibility refers to the interaction between building materials and the biological environment and their impact on organisms.

Therefore, bio-compatibility is also a necessary consideration for future architectural design. By combining bio-compatible design with architecture, it not only alleviates environmental problems, but also involves social and economic development. In short, biocompatibility represents a sustainable design concept and method that promotes harmonious coexistence between people, buildings and the environment. Wherefore, in the latest research, we can see that designers pay attention to the creation of spatial atmosphere and people's experience, as well as the continuous exploration of new sustainable materials. Therefore, in addition to cultural transmission, global sustainability is still the focus of people's architectural design in the 21st century.

#### 4. Conclusion

The term sustainable development has become very popular. According to this concept, buildings should cause minimal harm to the environment. Modern China has been constantly exploring architectural design styles based on this concept. In the 21st century, Chinese designers no longer pile up traditional elements in architecture, but integrate Chinese traditional virtues and cultural essence into architecture. The use of new materials breaks through traditional materials, making buildings more low-carbon and environmentally friendly, and combining green sustainable concepts to promote the organic development of green cities. The value of architecture reflects both cultural value and commercial value, and its functions are more diversified. Unlike Western countries, my country's current situation is highly developed urbanization and dense population.

Therefore, future buildings need to meet the functional needs of high-density cities while being low-carbon, such as increasing the height of buildings. This article mainly sorts out the morphological evolution of contemporary Chinese architecture, analyzes and discusses 21st century architecture, critically points out the influence and limitations of different buildings, and lays a case reference for future architectural design trends. It provides case support for studying the evolution of Chinese architectural style in the 21st century. However, this study also has certain limitations, such as the short time span of the selected cases and only one third of the 21st century has passed, which will lead to an incomplete analysis of the evolution of Chinese architecture. In terms of regional selection, cities are mainly highly developed cities, mainly Beijing and Shanghai. Although they are representative and economically developed regions in my country, they still have geographical limitations because high-density cities and ordinary cities have different requirements for building development and urban planning. Overall, future research on Chinese architectural style can use this as a basis to analyze the architecture of the 21st century and the future [10].

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