

Preliminary Study on Overseas Applicability of Chinese Architectural Design Standards: Taking China-Aided Construction Projects in Asia Since the Belt and Road Initiative as Examples

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Abstract: This research takes China-aided construction projects in Asia since the Belt and Road Initiative as examples to explore the applicability of Chinese architectural design standards in other Asian countries. So far, the standards demonstrated the highest applicability in South Asia is the best followed by Southeast Asia. Chinese architectural design standards for educational buildings showed the highest applicability, followed by office, medical, and sports buildings. This study puts forward some strategies to improve the applicability of Chinese architectural design standards. These strategies include integrating regionalism and local cultural traditions, optimizing energy efficiency, and aligning designs with local usage habits. This study serves as a reference for similar projects in the future.

Keywords: Chinese building design standards; Overseas applicability; China-aided construction; Belt and Road Initiative

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1. Introduction

In recent years, China has attached great importance to the internationalization of Chinese standards. As an important part of a country's core competitiveness, standards play an important role in international trade and market access in the context of economic globalization. Bringing Chinese standards to the world plays a vital role in promoting the Belt and Road Initiative, which will facilitate the export of Chinese products and services to a wider range of international regions, and promote technological and management advancements in countries along the Belt and Road.

Chinese construction projects exported overseas as part of the Belt and Road Initiative have garnered significant international attention, yielding numerous social and economic benefits. The adoption of Chinese architectural design standards enhances efficiency for domestic construction enterprises, improves connectivity with local materials and equipment, and reduces costs and obstacles. The effective application of these

standards in different countries and regions has become a critical factor in the success of China's overseas construction endeavors. Ensuring China's leadership in overseas construction projects and facilitating the design, management, and construction processes of Chinese enterprises largely hinge on the applicability of Chinese architectural design standards. Moreover, the acceptance and affirmation of Chinese architectural design by recipient regions depend largely on the adaptability of these standards to local expectations and requirements. It is anticipated that more overseas projects will utilize Chinese architectural design standards in the future. Advancing in this direction relies significantly on exploring and enhancing the applicability of these standards in overseas construction projects.

The current research on China's overseas construction projects mainly focuses on the investment and construction of China's overseas projects^[1,2] or the policy and economy of China-aided construction^[3-5]. While there have been some studies on the history of China-aided constructions^[7,8], most of them revolve around architectural design development^[8-11] or certain architectural design techniques^[12-15]. However, there has been a lack of research on China-aided buildings since the "Belt and Road" Initiative, particularly in Asia. Moreover, studies on China's building standards predominantly concentrate on the domestic situation and the applicability of individual standards, such as green building evaluation standards^[16-18]. Most studies on the export of Chinese building standards overseas focus on macroscopic engineering construction^[19] or technical service standards^[20], others are comparative analyses of projects in several countries^[21,22], with less emphasis on the applicability of Chinese architectural design standards in overseas projects. In general, domestic and foreign research on the applicability of Chinese architectural design standards in overseas projects is scarce. This study can provide theoretical basis and practical guidance for the overseas application of Chinese building standards, and make up for the relevant research gaps to a certain extent.

2. Status quo of the overseas application of Chinese architectural design standards

According to statistics, since the Belt and Road Initiative commenced, only about 35% of China's overseas construction projects have used Chinese architectural design standards. The majority of projects adopting these standards are China-aided projects, while commercial projects tend to adhere to local, European, or American standards. Notably, major exporters like the United States and Europe typically use their own standards in aided projects and commercial ventures. As of 2022, China has supported over 300 construction projects overseas, primarily in Asia, Africa, Latin America, and a few in the Pacific and European regions. The adoption of Chinese design standards in China-aided projects varies by region, with a notably larger proportion in Asia compared to other regions (**Table 1**).

Asia was the first region in which China carried out construction project aid. Since the 1950s, many of the buildings aided by China in Asia, such as the Parliament Building in Sri Lanka and the Sports Center in Pakistan, have become representative buildings in the recipient countries, making important contributions to the improvement and modernization of infrastructure in the recipient countries. In recent years, China's significant foreign aid construction projects have predominantly been concentrated in Asia. Examples include the largest and most expensive foreign aid stadium, the Cambodia National Stadium, and the largest and most expensive foreign aid hospital, Mahosot Hospital in Laos. Therefore, this study focuses on China-aided construction projects in Asia to examine the application of Chinese architectural design standards overseas.

Table 1. Application of architectural design standards for China-aided construction projects from 2012 to 2023

	Africa	Asia	Oceania	Latin America	Europe
Standards in use	French standards Chinese standards Domestic standards	Chinese standards Domestic standards	French standards Domestic standards	French standards Domestic standards	European standards

3. Evaluation of the overseas applicability of Chinese architectural design

Based on previous data collection and analysis, we selected 23 representative building projects of different building categories such as office, medical, cultural, sports, and education in different regions of Asia as research subjects (Table 2).

Table 2 The applicability of architectural design standards of construction projects included in this study

Regions	Country	Project name	Time	Category	Applicability
South Asia	Sri Lanka	National Art Theatre of Sri Lanka	2013	Cultural building	High
	Sri Lanka	High Court Building of Sri Lanka	2017	Office buildings	Medium
	Sri Lanka	China-Sri Lanka Friendship Hospital - Nephropathy Specialist Hospital	2018	Medical building	Medium
	Maldives	Building of Ministry of Foreign Affairs of Maldives	2014	Office buildings	High
	Bengal	Bangladesh-China Friendship Exhibition Centre	2015	Cultural building	High
	Nepal	Nepal's National Armed Police Academy	2017	Educational building	High
	Nepal	Gili Secondary School in Nepal	2020	Educational building	High
Southeast Asia	Laos	International Conference Center of Laos	2012	Cultural building	High
	Laos	Reception building for Laotian Heads of State	2014	Office building	Medium
	Laos	Mahoso General Hospital in Laos	2018	Medical building	Low
	Laos	Piwa Middle School in Vientiane, Laos	2020	Educational building	Medium
	Laos	Railway Vocational and Technical College in Laos	2022	Educational building	High
	Cambodia	Education and Training Center of Vocational and Technical in Sihanoukville Province, Cambodia	2015	Educational building	High
	Cambodia	Cambodia National Stadium	2017	Sports building	Medium
	Cambodia	Cambodia Government Building – “Friendship Building”	2018	Office building	Low
	Myanmar	National Center for Disease Control and Prevention of Myanmar	2021	Medical building	High
	Vietnam	China-Vietnam People's Palace	2017	Cultural building	Medium
East Asia	Mongolia	Schools in Mongolian (Phase I, Phase II, Phase III)	2019	Educational building	High
	Mongolia	Development Centre for Disabled Children in Mongolia	2020	Cultural building	Medium
Central Asia	Yemen	Ye-China Friendship Hospital	2013	Medical building	High
	Yemen	Ye-China University of Science and Technology	2014	Educational building	High
	Yemen	National Library of Yemen	2015	Educational building	Medium
	Lebanon	National Concert Hall of Lebanon	2020	Cultural building	Medium

This research compares and analyzes the differences in the applicability of Chinese architectural design standards in different regions and different categories of buildings, as shown in **Figure 1** and **Figure 2**. Based on the results of the analysis, Chinese architectural design standards demonstrate the highest applicability in China-aided buildings in South Asia, with slightly lower applicability observed in Southeast Asia. Among different building types, educational buildings exhibit the highest applicability, followed by cultural buildings, while office, medical, and sports buildings show slightly lower applicability levels. The differences in applicability across Asian regions may stem from variations in regional development levels and the adoption of European and American norms in some areas (such as Vietnam and some other countries). Furthermore, variances in applicability across building categories are influenced by the characteristics of specific building types and the development levels and usage requirements of recipient countries. For instance, educational and cultural buildings have been widely accepted and affirmed due to the relatively low development levels in recipient areas, resulting in few special provisions in local codes. Conversely, medical buildings often face challenges due to high requirements for municipal infrastructure, which may not align with the lower infrastructure development levels in many aided areas. Additionally, differences in usage habits and cultural customs contribute to varying levels of applicability for sports and office buildings between China and recipient countries.

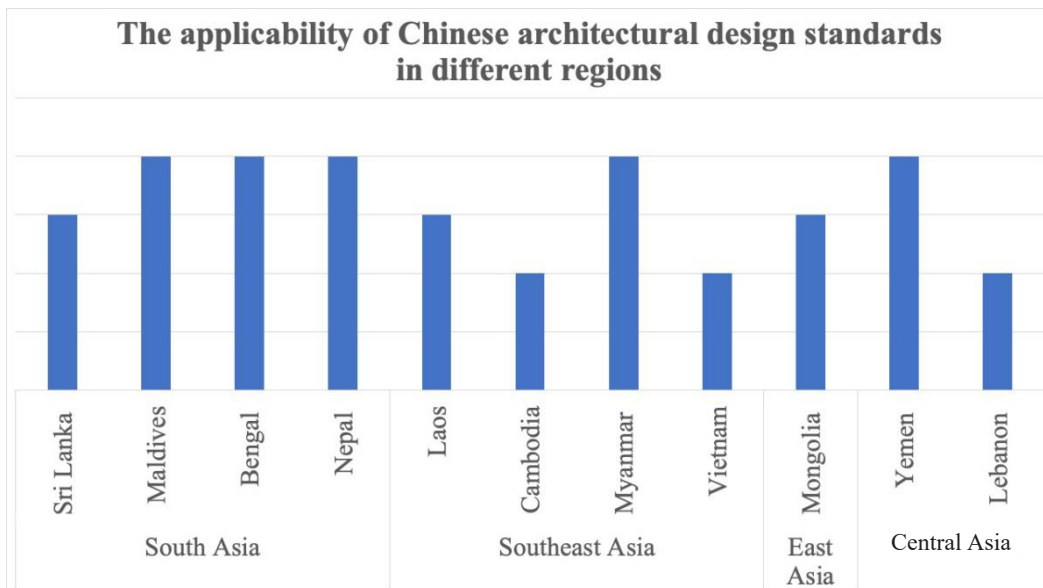


Figure 1. The applicability of Chinese architectural design standards in different regions

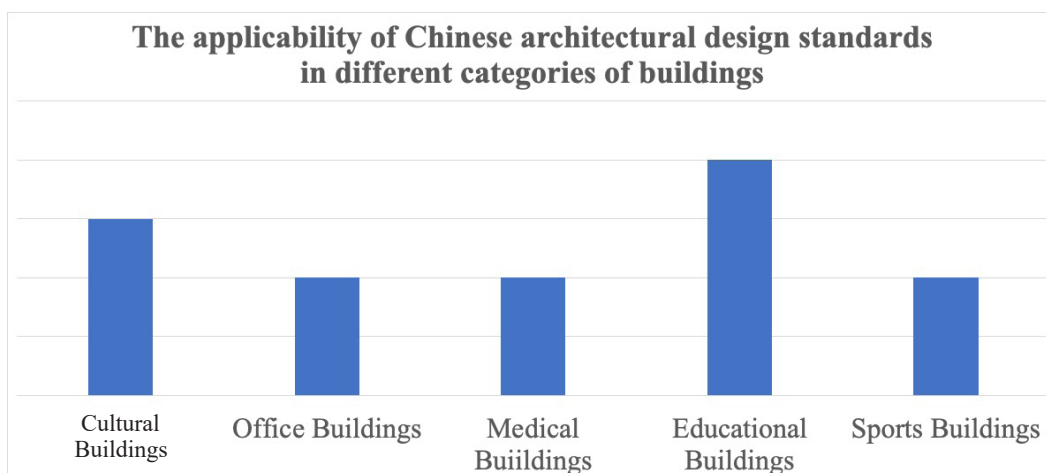


Figure 2. The applicability of Chinese architectural design standards in different categories of buildings

4. Effective strategies for the overseas application of Chinese architectural design standards

Based on our findings, we have devised several effective strategies for applying Chinese architectural design standards overseas. These strategies aim to assist Chinese architects in avoiding potential pitfalls in future designs, offering appropriate solutions in regions or architectural categories with limited applicability, and broadening the utilization of Chinese architectural design standards in a wider range of scenarios.

4.1. Regionalism design in combination with local cultural traditions

Considering the variations in regional cultural traditions among different countries, it is imperative to conscientiously account for the influence of local cultural customs when applying Chinese architectural design standards in overseas architectural projects. The accurate understanding and respectful expression of local cultural traditions in architectural design are pivotal factors in ensuring the successful implementation and utilization of aid construction projects, ultimately enhancing the quality of such endeavors. This approach significantly improves the applicability of Chinese architectural design standards in overseas projects. For instance, in the design of the International Conference Center in Laos, Chinese architects seamlessly integrated the traditional architectural style of Laos with contemporary architectural design principles. By adopting a regionalism approach that amalgamated new-era architectural design language with local cultural traditions, the building garnered widespread acclaim and demonstrated high applicability in both construction and usage contexts.

4.2. Passive design in consideration of local infrastructure conditions

In many cases, Chinese-aid projects are situated in less developed regions with limited infrastructure. Consequently, challenges often arise during the construction and utilization of China's architectural design standards for foreign aid projects. To address these challenges effectively, the adoption of passive design principles, which demand lower infrastructure requirements, can be highly beneficial. For instance, in the design of medical buildings in less developed areas like Cambodia and Laos, the utilization of elevators and other electrical equipment typical under China's architectural design standards may encounter issues related to inadequate power supply. Moreover, ensuring continued use and maintenance in the long term can be challenging. Therefore, employing passive design features such as long ramps can help alleviate power load while still meeting the requirements for barrier-free design in medical buildings. Similarly, in the design of sports facilities in hot climates, passive ventilation strategies like utilizing gray space and hollow plates can be advantageous over active design solutions such as large ventilation equipment like air conditioning. This approach is more aligned with local infrastructure conditions and can contribute to more sustainable and cost-effective solutions.

4.3. Aligning with local use habits

Due to the diverse user habits across different regions, the applicability of Chinese architectural design standards should be tailored to specific circumstances and meet differentiated user requirements. For instance, when designing educational buildings, the programs offered, the teaching methods, and the management modes of the campus should be considered. Under the framework of Chinese architectural design standards, accommodating these differences through corresponding design adjustments is crucial. In some cases, it may even be necessary to introduce new design elements to address specific needs. For example, primary and secondary schools may have different requirements compared to their counterparts in China in terms of class capacity and orientation habits. By gaining a deeper understanding of local usage habits, innovative design

enhancements can be implemented to better cater to the needs of users in these regions.

5. Conclusion

This research explores the overseas applicability of Chinese architectural design standards by examining China-aided construction projects in Asia since the Belt and Road Initiative and proposing effective strategies. The majority of overseas projects adopting Chinese architectural design standards are China-aided, with a notably higher proportion in Asia compared to other regions. The study finds that the applicability of Chinese architectural design standards in foreign aid projects is highest in South Asia, with slightly lower applicability in Southeast Asia. Educational buildings exhibit higher applicability, whereas office, medical, and sports buildings show slightly lower levels of applicability. To enhance the applicability of Chinese architectural design standards overseas, strategies such as regionalism design, passive design principles aligned with local infrastructure conditions, and customization to local usage habits are proposed. By effectively incorporating these strategies, Chinese architectural design standards can better adapt to local customs, meet the expectations and usage requirements of local populations, and gain greater acceptance and affirmation in recipient areas. This lays a solid foundation for the broader application of Chinese architectural design standards in future overseas projects.

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Disclosure statement

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