

## Conference Paper

# Regional Design Attempts of China-aid Stadiums

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## Abstract

Since the 1960s, China has exported a large number of foreign aid buildings to numerous recipient regions, initially as a member of the socialist camp spreading their post-war influence on developing countries, then as catalyzer of diplomacy and economic development. Among these constructions are a considerable proportion of stadiums. Because of their landmark effect and lasting time of use, these overseas stadiums stand out from other types of China-aid buildings. From neighboring countries in Asia to brotherhood countries in Africa, Latin America and Oceania, these large-scale projects are located in different and complex geographical and cultural contexts. However, most of these projects were designed by Chinese architects from domestic design institutions. The integration of these buildings into the local environment and urban context becomes a significant issue for architectural design. Through detailed analysis of the representative case projects, and interviewing of people involved in the design and management process, we aim to explore and discuss regional design attempts and common methods used by Chinese architects when designing these cross-border stadiums, so as to provide reference for architectural design of this category in the future.

**Keywords:** China-aid; stadium; regional design

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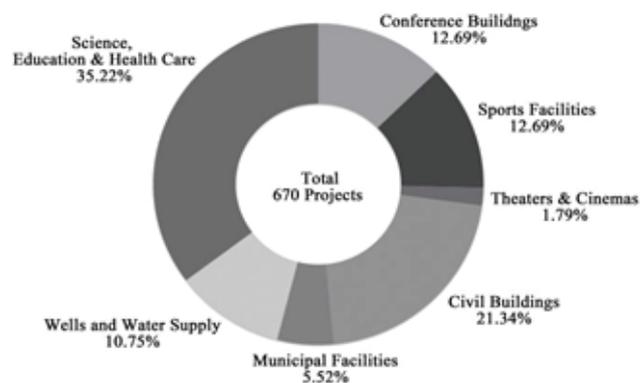
## 1. Introduction

Foreign aid activities originated from America's assistance to western European countries under the guidance of the "Marshall Plan" after World War II, showing its "modernization" prospect and promoting ideology with the slogan "You Too Can Be Like Us" [1]. At the same time, the socialist countries, headed by the former Soviet Union, also carried out a variety of assistance projects in Asia, Africa and other places, which promoted the improvement of living standards and modernization of the recipient countries. Since the early 1950s, China received a number of aid projects from the Soviet Union and other socialist countries. After the late 1950s, China began to provide assistance to developing countries such as Asia, Africa and Latin America. Till now, China had given assistance to over 100 countries in more than 2,000 completed projects and completed over 1,400

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buildings, including government offices, parliament buildings, convention and exhibition centers, stadiums, theaters, schools, hospitals, libraries, railways and railway stations, etc. (This number is from the authors' own collected database. Sources include the websites and news reports of government and design/construction companies)

Among China's foreign aid buildings, sports facilities occupy a considerable proportion (Fig. 1), mostly stadiums. By the end of 2018, the number of China-aid stadiums has exceeded 100, becoming a significant part of China's foreign aid buildings. Covering various regions in Asia, Africa and Latin America, China-aid stadiums hold considerable quantity and far-reaching influence. Different from China's domestic stadiums, the environment and contexts of which Chinese architects are more acquainted f, overseas stadium design provides opportunities as well as challenges for Chinese architects. Whether these exported buildings follow the regional characteristics, and whether they respect and attach importance of the relationship between architectural and regional factors such as environment, city and culture, are significant issues during the design phase. However, influenced by the international spread of modern building materials, long-span spatial structures, technical equipment, PPP (Public-Private Partnerships) and other financing modes, stadiums often enter the mainstream of modernity and convergence [2]. Therefore, the analysis of regional design of these cross-border stadiums, with correlations between natural climate, site environment and urban context, holds significant meaning.



**Figure 1:** Statistic of China's construction aid (drawn by the authors, based on China Aid White Paper 2011 [3]).

It is worth noting that China-aid stadiums, during the development of over half a century, have paid increasing attention to regionalist issues. Most of the stadiums were designed with regional features and flexible techniques. Since their completion, most of them have been in good operation and many activities in sports, culture, politics and

other fields have been held in them and have been widely praised by recipient countries. A number of excellent architectural cases have emerged, which constitute a significant chapter of Chinese modern architecture. Thereby, this paper aims to provide a general introduction to China-aid stadium, to summarise the design methods frequently utilized by Chinese architects in designing these overseas stadiums from representative cases, and to provide guidance for future architectural design of cross-border constructions.

## 2. General Information of China-aid Stadiums

Since late 1950s, China has exported over 100 stadiums around the world, located originally in Asia and Africa (1960s to 1980s), then expanding to Oceanian countries (1980s to 1990s) and later to Latin American countries (after 2000) (Fig. 2). the number is generally on the rise, especially in the 21st century (Fig. 3). These stadiums are located in countries and regions with disparities of geographical locations, climatic environments, urban development situations, human histories and other complex factors. Therefore, it is very difficult to achieve regionalism in the design of these buildings. Fortunately, Chinese architects and engineers never stopped their efforts in exploring regionalist design in these overseas projects and produced good examples of cross border stadiums.

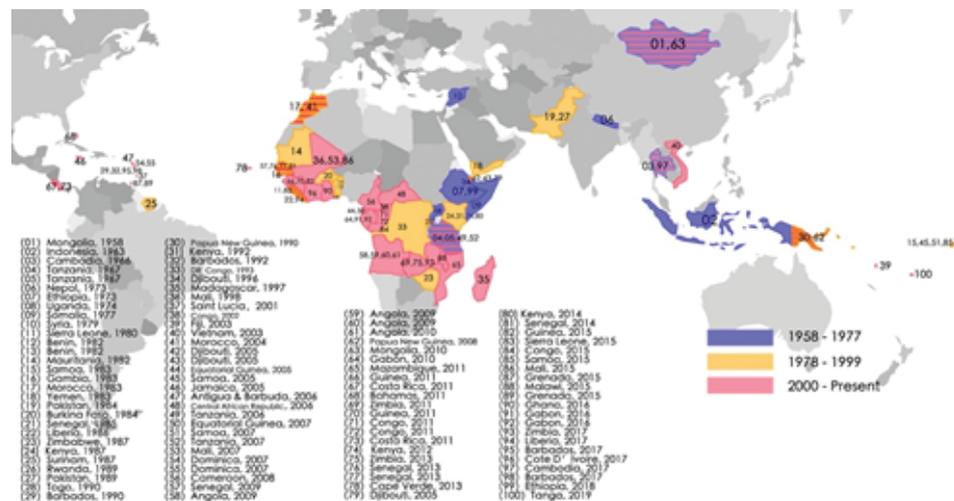
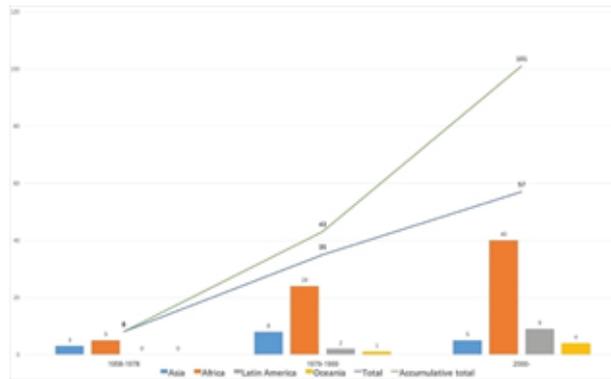


Figure 2: Regional distribution of China-aid stadiums (drawn by the authors).



**Figure 3:** Numbers of China-aid stadiums by areas (drawn by the authors).

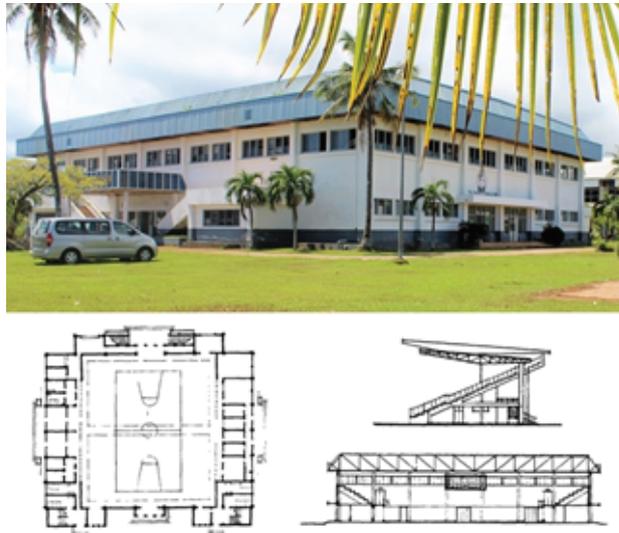
### 3. Regional Design Strategies for China-aid Stadiums

#### 3.1. Bio-Climatic Regional Design

Among the factors that influence the architectural design of overseas stadiums, the environment and climate are the only ones that stay relatively constant. In the design of China-aid stadiums, bio-climatic information was taken into considerations when doing the regional design - obvious in some early aid stadiums in the 1980s. These buildings were designed in accordance with the significant factors of climatic and natural elements, such as sunlight and wind. Through reasonable arrangements of architectural design elements like layout, orientation, space and materials, these natural elements were utilized appropriately through the application of natural ventilation, shading and other technologies.

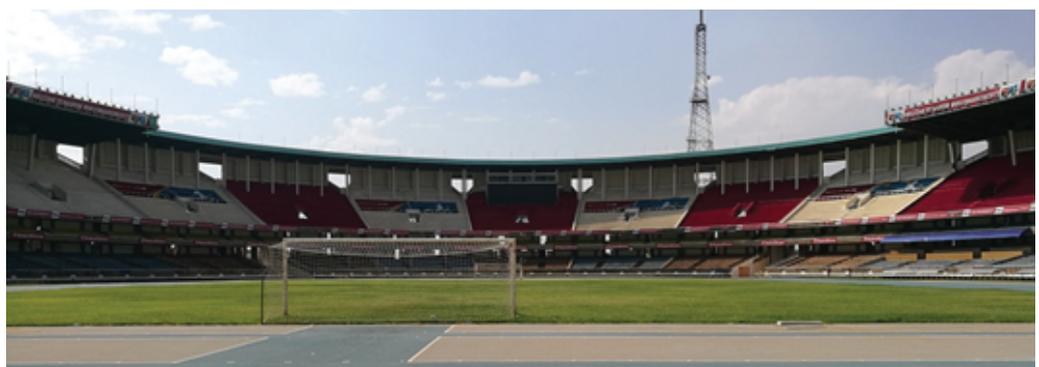
For example, the China-aid indoor stadium (Fig. 4) in Samoa built in the 1980s is one good example of a regional design, with low passive technologies utilized to adapt to the weather. This 1000-seat indoor stadium was designed and constructed for the holding of the 7th South Pacific Games in 1983 soon after the independence of Western Samoa, together with a track field, a stand for 2000 spectators, a rolling course and a rest room. Architect Ai Binggen from Jiangsu Provincial Architectural Design Institute, took the local and climate conditions into much consideration in the design of the venue. Although mechanical ventilation equipment was installed in the stadium, doors and windows of each room were carefully arranged to achieve better airflow, with special local-style hollow screening on the external walls of the rest platforms, to generate natural ventilation, which meanwhile added local characteristics to the facade. A white roof was used to reduce the heat from solar radiation and insulation was added to the roof panel to improve the effect of heat insulation and cooling. Light yellow walls with a

dark green cornice contributed to the building's harmony with its natural environments [4].



**Figure 4:** Indoor stadium in Samoa, 1983 [4].

Such low passive technologies were commonly used in China-aid stadiums, especially in Africa (e.g., Moi International Sports Center, Kenya, Fig. 5) or other tropical regions, where natural ventilation weighs more over mechanical systems. Known from our interviews with the chief engineers and managers from China Sports Industry Group (CSIG), one state-owned enterprise that operates and consults for most of these aid stadium projects, these adaptive technologies were greatly encouraged in the design of the stadiums for their good cost performance and effective application. This reflects the preference for bio-climate methods in the regional design of oversea stadiums by Chinese architects.

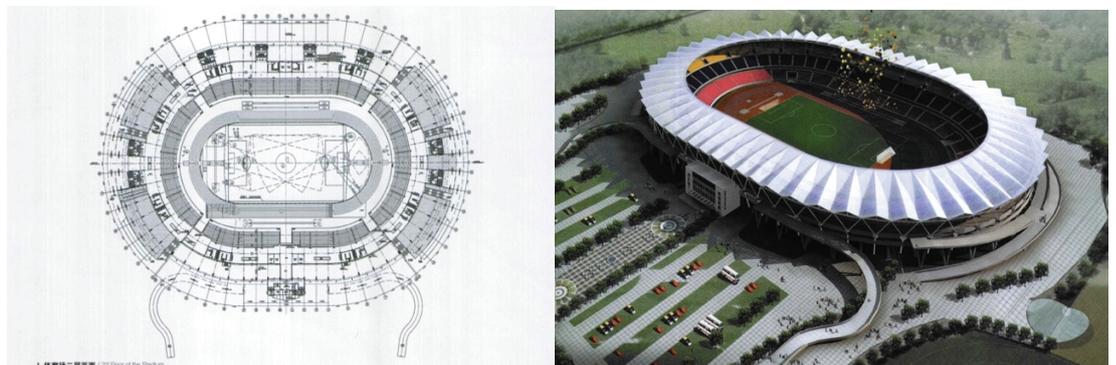


**Figure 5:** Moi International Sports Centre, Kenya.

### 3.2. Standard-Compliant Regional Design

Like other overseas aid projects, use of Chinese standards is one of the compulsory requirements when designing overseas aid stadiums. As stated by most of the interviewees in our research, Chinese architects tend to try hard to adapt Chinese design and standards to local circumstances, such as habits, specifications, criteria and other standards, with necessary revisions. Such compliance is also encouraged in the “Eight Guiding Principles” (The “Eight Guiding Principles” includes “standard application”, “overall planning”, “investment matching”, “function priority”, “technological innovation”, “environmental protection”, “convenient maintenance” and “sustainable development”) proposed by the Ministry of Commerce of China to instruct the overseas construction, of which “standard application” comes first.

For instance, in the design of the Tanzania national stadium, chief architect Jiang Hong from Beijing Institution of Architectural Design (BIAD), noticed the country’s preference for football games and the low frequency of international games and of track and field competitions. He therefore chose to shape the stands with two straight east-west edges and two semicircles rather than the four circle-center shape commonly used in China’s domestic large stadiums. This was to minimize the horizon distance between the audience and the site for football games. Due to the fact that over 10% of the local population was disabled, the number of seats for disabled people was higher than that required by China’s barrier free design standard. Two large special barrier-free ramps were also added to increase the convenience and capacity of the traffic into the stadium [5] (Fig. 6).



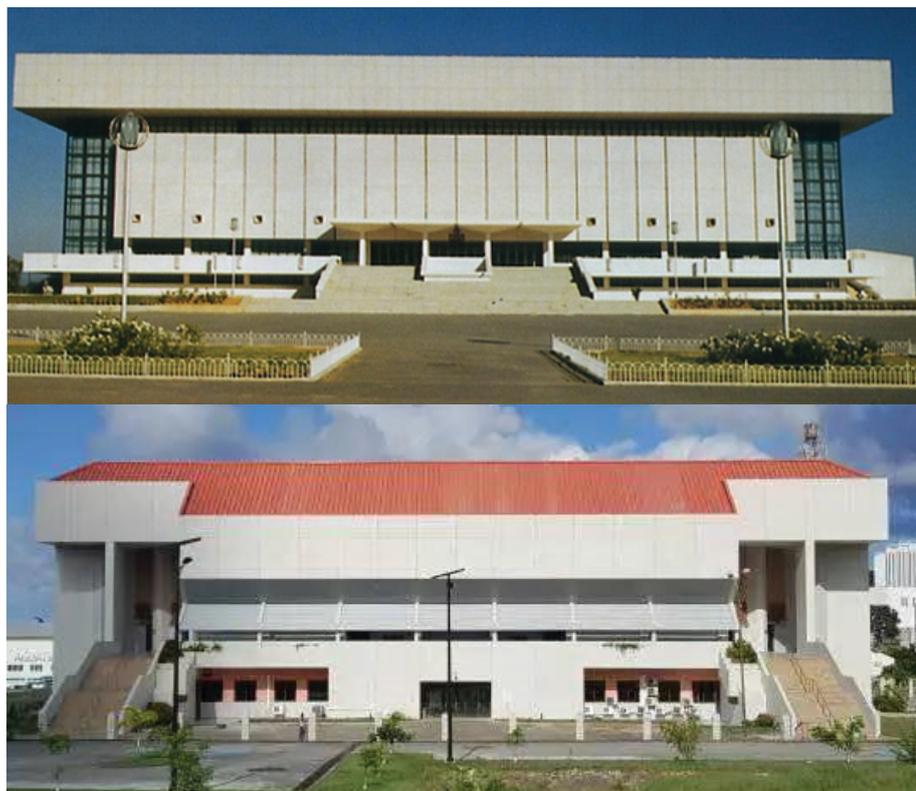
**Figure 6:** Tanzania National Stadium [5].

These strategies in the design of China-aid stadiums aim to mediate the conflicts caused by the difference between Chinese standards and the recipient countries’ own standards, and to reduce the problems that might appear otherwise. Basically, most of these overseas stadiums function well and received approval in their home country.

### 3.3. Ritual-Considered Regional Design

Ritual-considered regional design in stadiums refer to incorporating rituals as a symbol of aesthetics, culture, and totem, as a sort of mass media, and integrating them into the local contexts through aesthetic or morphological methods. This kind of strategy effectively fends off blind-modernization, and advocates the return to the creation and expression of a regional context.

One of the approaches to achieve ritual-effective regionalism is to transfer the local architectural style into new importations. For example, the stadium of China-aid complex sports center in Pakistan (Fig. 7, left), built with China's assistance in the 1980s, was one of the representative examples. The half-open structure was adapted into the form, decorated by the local Islamic traditional geometries in certain parts to reflect the local characteristics, inheriting the decorative characteristics of the Islamic architecture, and echoing the traditions of local culture. Another example was the Barbados indoor stadium aided by China, the designer of which planted the commonly used approach of combining the traditional spire arch and unique roof forms with the modern block style by local architects. The inclined roof was made of corrugated metal plates, generating a sense of traditional colors and customs for this new stadium (Fig. 7, right).



**Figure 7:** stadium of China-aid complex sports center in Pakistan (left) and China-aid indoor stadium in Barbados (right).

Another common approach in the ritual-effective regional design of China-aid stadiums is the abstract metaphor and imitation of national artifacts. With characteristics of certain national objects, such as form and color, the stadium becomes a new totem of national culture with exaggerated size [2]. In 2002, BIAD won the bid for the new national stadium project in Abidjan, Cote d'Ivoire with the creative concept of "African drum". Located in the Olympic city of Abidjan, this 60,000-seat large stadium needs to meet the requirements of various international competitions such as track and field, football and rugby. Its chief architect, Liu Miao explains in our interview that the idea of the "drum" came to him while he was watching a football game at night after work, while relaxing from the anxieties of deciding on the form. The local cultural and sports devotion of African people occupied Liu Miao's mind and an appropriate concept was inspired by the sound of the game he was watching. The main image of this mega-structure was just like the national drum in his own country with local ethnic characteristics. The building's facade was designed with orange interior walls, white rods and a green plinth, which echoes the colors of the national flag and highlights the national image of the recipient country (Figure 8).



**Figure 8:** China-aid stadium in Cote d'Ivoire ([http://www.sohu.com/a/163290568\\_778452](http://www.sohu.com/a/163290568_778452)).

In addition, ritual-effective regionalism can also be expressed through the symbolic metaphor of natural elements with aesthetic handling. For example, the China-aid new national stadium in Costa Rica designed by Central South Architectural Design Institute (CSADI), was shaped as the "sail of the sea", which echoes Costa Rica's costal geography and highlights the symbolic significance of this new landmark. Meanwhile, Costa Rica is one of the most famous volcanic countries, with seven world-known active volcanoes; its national emblem also has a volcanic logo. Therefore, the designer chose to make a continuously wavy plate on the large arch structure of the stadium to symbolize the volcanos, reflecting the distinct regional characteristics by the image of the stadium (Fig. 9).



Figure 9: China-aid stadium in Costa Rica.

## 4. Conclusion

With the development of structure and technologies in mega-structure construction, especially the extensive use of space and membrane structure, stadiums are relieved from adopting the simple form of a concrete frame structure into more diversified solutions. Because of this, Chinese architects are given greater freedom and possibility to create more vivid and complex forms for the stadiums. Therefore, in recent years, the ritual-considered design methods were utilized more in form-making rather than the decoration and other detailed design. Symbolic features with cultural or national image tend to be more acceptable for the recipient countries, as stadiums have always become landmarks in their contexts and venues for national or cultural events.

Since the recipient countries are mostly located in tropical areas such as the South-east Asia, Africa and Latin America, mega-structures such as stadiums require a high degree of ventilation. However, since the economic and infrastructural development are relatively low in these developing countries, where sometimes the power supply is a serious problem, it may be unaffordable to rely entirely on mechanical ventilation. Therefore, Chinese architects choose low passive technologies, which seem to be adaptable methods to complete bio-climatic regional design. This method can be found not only in former China-aid stadiums, as explained above, but also in new projects of the present era.

It is undeniable that for the recipient countries, China-aid stadiums provide important places for sports activities and social, cultural or national activities. Such outcomes are inseparable from the strategies and propositions for the regional design of these cross-border stadiums by Chinese designers. Through various categories of approaches such as bio-climate, standard-compliance and ritual effective regional design methods, these exported constructions may be well integrated into the local climate, culture and

urban contexts, functioning in longer period with better results. In addition, we believe that if these regional designs strategies are utilized or considered in the design of other oversea architectural projects, cross-border buildings may be more adaptable, acceptable and less foreign.

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## Conflict of Interest

The authors have no conflict of interest to declare.

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