

Research on the Sports Legacy of Brazilian Stadiums from the 2014 FIFA World Cup

This study was conducted by the Inteligência Esportiva Research Institute (IPIE) in partnership with the Danish institution Play The Game. The objective of the research was to gather information about the use of the 12 stadiums built or renovated for the FIFA World Cup in Brazil in 2014, during the years following the event. The collected information was then discussed based on the projections made by Play The Game in 2012, in the document "World Stadium Index."

World Stadium Index and Brazilian World Cup Stadiums

In 2012, Play The Game conducted an analysis to discuss the legacy left by stadiums used in international mega-sports events. The main theme of the study was the use of sports infrastructures by a host nation, after the sports mega events. In order to discuss the theme in an international context, a common measure was proposed, the World Stadium Index. The study was based on the relationship between the number of spectators each stadium received in each season/year and its total seating capacity. The original study took into account not only sports events but also cultural and religious events. To achieve the maximum score within the index, the stadium would need to have a seasonal/annual attendance 100 times larger than its capacity. Thus, the index serves as an indicator for analyzing the sports legacy of the infrastructure built or renovated, as well as allowing comparisons between regions, countries, and seasons.

Play the Game conducted the same study also in Brazil, which was called "Brazilian World Cup Stadiums: a predictable legacy challenge,". The World Stadium Index, in this country, considered only the infrastructure prepared for the 2014 FIFA World Cup in Brazil. The projections made by the Danish organization indicated that Brazilian stadiums would fall below the international average, advising that the stadiums would have a low use in the country. The report also called for action in order to strengthen plans for the utilization of these spaces after the event.

Regarding the results from 2012, it previewed that Brazilian stadiums would perform below the average. This finding could represent a problem of public interest, considering that in many cases, the main financiers and owners of the stadiums are public entities. In Brazil, 8 out of 12 stadiums belong to public entities, highlighting the importance of verifying the predictions developed by Play The Game.

The Brazilian Stadiums Index 2023: 10 years passed by

In order to reconduct Play The Games 2012 study, this study replicated the methodology used in the previous study. The data was gathered from *worldfootball.net*¹ website, the same source previously selected. The time frame of the current study contemplated the seasons played between 2015 and 2022, in Brazil. The seasons of 2020 and 2021 were excluded due to the COVID-19 pandemic, which imposed a scenario of social distancing and consequently the suspension of public attendance at sports events. Additionally, another criterion applied to this study involved the classification of the events which excluded, religious and cultural events, The results are presented below, with a description of the data found on the audience each stadium

¹ Available at: <https://www.worldfootball.net/>

received during sports events, considering the seasons included in the defined timeframe. In Table 1, the annual audience was divided by the total stadium capacity, replicating the calculation performed by the original World Stadium Index.

Table 1: Relationship between annual audience and total capacity of the stadiums used in the FIFA World Cup.

Stadium	Attendance in each year/ World Stadium Index							
	2015	2016	2017	2018	2019	2022	Geral	World Stadium Index (2015 – 2022)
Neo Química Arena	13,2	13,0	14,0	11,5	16,3	19,6	14,6	13,0
Maracanã	11,5	6,7	12,2	17,7	31,5	29,8	18,2	9,2
Arena da Baixada	8,2	7,2	11,0	7,6	12,8	14,7	10,2	7,6
Arena Fonte Nova	8,2	7,1	7,5	6,8	13,4	3,7	7,8	9,7
Castelão	5,0	3,4	6,0	17,0	20,0	31,5	13,8	6,4
Arena Pernambuco	7,0	4,5	3,6	0,00	0,00	0,5	2,6	5,9
Arena Pantanal	0,9	0,7	0,1	0,00	2,0	7,1	1,8	0,8
Estádio Nacional de Brasília	1,8	2,6	0,00	0,00	0,2	2,8	1,2	0,9
Arena Amazônia	0,00	1,1	0,00	0,00	0,6	1,8	0,6	3,2
Estádio das Dunas	1,0	1,6	0,00	0,00	0,1	3,7	1,1	1,5
Mineirão	12,0	9,3	7,2	10,3	18,2	28,9	14,3	9,0
Beira Rio	11,2	8,8	7,5	9,4	13,1	9,4	9,9	11,1

Organized by the authors (2023).

The calculated average for each season shows that 7 stadiums had a higher index than predicted by Play The Game (Neo Química Arena, Maracanã, Arena da Baixada, Castelão, Arena Pantanal, Estádio Nacional de Brasília, and Mineirão), while 5 stadiums had worse results than the projections indicated (Arena Fonte Nova, Arena Pernambuco, Arena Amazônia, Estádio das Dunas, Beira Rio). Furthermore, 4 stadiums achieved an index higher than the average presented by the World Stadium Index.

As predicted, the Neo Química Arena had a relatively positive legacy in terms of utilization for sports events (14.6), as well as the Maracanã Stadium (18.2), which achieved the highest average among all Brazilian stadiums, and the Beira-Rio Stadium (14.3) and Castelão Stadium (13.8). On the other hand, 5 stadiums occupy lower positions in the ranking presented by the index. Among them are the Arena Pantanal (1.8), Estádio Nacional de Brasília (1.2), Estádio das Dunas (1.0), and Arena Amazônia (0.6), which were identified by the Danish institution as venues that would struggle to establish a satisfactory sports legacy. Arena Pernambuco also had a low utilization index (2.6).

In addition to the calculation performed in the World Stadium Index, this study also calculated the relationship between the average audience in the six analyzed seasons and the stadium's total capacity to obtain the average percentage of audience occupancy in sports events. Table 2 presents the results.

Table 2: Average of audience occupancy in the stadium.

Stadium	Capacity	Average of audience 2015-2022	Number of games	Average (%)
Neo Química Arena	63.267	38.942	171	61,5%
Maracanã	79.000	39.558	256	50,0%
Arena da Baixada	41.456	20.629	163	49,7%
Arena Fonte Nova	56.500	26.253	134	46,5%
Castelão	60.326	29.762	193	49,3%
Arena Pernambuco	46.154	12.590	89	27,3%
Arena Pantanal	44.097	11.577	60	26,3%
Estádio Nacional Brasília	72.888	21.993	31	30,1%
Arena Amazônia	43.710	15.408	27	35,2%
Estádio das Dunas	42.001	13.733	25	32,7%
Mineirão	64.500	31.685	203	49,1%
Beira Rio	58.306	31.560	141	54,1%

Organized by the authors (2023).

Examining the number of games each stadium hosted, it can be observed that some infrastructures surpassed 200 games in six seasons, while others were used fewer than 30 times during the same period. It is also noted that, on average, in stadiums with the highest utilization

rates, the audience occupancy per game hovers around 50% of its total capacity. Only the Neo Química Arena achieved an occupancy rate above 60% per sports event held at the stadium.

Considering the influence of the level of football competitions played by the home teams, Table 3 presents the data on the home teams for each stadium in the sample in terms of the division they played within the national championship during the six seasons. According to the study conducted by Play The Game, this factor can also be considered an indicator to predict the level of stadium utilization.

Table 3: Relationship between home teams and the division played in each season for stadiums not used in the FIFA World Cup.

STADIUM	CLUB	DIVISION - YEAR					
		2015	2016	2017	2018	2019	2022
Neo Química Arena	Sport Club Corinthians Paulista	A	A	A	A	A	A
Maracanã	Fluminense	A	A	A	A	A	A
	Flamengo	A	A	A	A	A	A
Arena da Baixada	Athlético	A	A	A	A	A	A
Arena Fonte Nova	Bahia	B	B	A	A	A	B
Castelão	Ceará	B	B	B	A	A	A
	Fortaleza	C	C	C	B	A	A
Arena Pernambuco	Santa Cruz	B	A	B	C	C	D
	Náutico	B	B	B	C	C	B
Arena Pantanal	Cuiabá	C	C	C	C	B	A
Estádio Nacional de Brasília	Legião	-	-	-	-	-	-
Arena Amazonas	Nacional	D	D	-	-	-	-
Estádio das Dunas	América	C	C	-	-	-	-
Mineirão	Cruzeiro	A	A	A	A	A	B
Beira Rio	Internacional	A	A	B	A	A	A

Organized by the authors (2023).

The data in Table 3 contributes to the discussion regarding the utilization of stadiums after the FIFA World Cup. However, it is not possible to establish a direct causal relationship.

It can be observed that in three stadiums (Neo Química Arena, Maracanã, and Arena da Baixada), the home teams remained in the top division of the Brazilian championship during the six seasons. Among them, only Arena da Baixada (10.2) had an index lower than the average presented by the World Stadium Index (13.4).

In three other stadiums (Arena Fonte Nova, Mineirão, and Beira Rio), the home teams experienced fluctuations from one season to another, having played at least once in the second division (Division B). Both Arena Fonte Nova (7.8) and Beira Rio (9.9) achieved utilization rates lower than the predictions by Play The Game (9.7 and 11.1, respectively). On the contrary, the utilization index at Mineirão (14.3) was higher than expected (9.0), surpassing the average of

the other stadiums indexed by the Danish institution. Additionally, the stadium also hosted a higher number of games (203) than Neo Química Arena (171) and Arena da Baixada (163), the stadiums where the home teams remained in the top division in all seasons. In two stadiums (Castelão and Arena Pantanal), the home teams played in lower-level national competitions in the year following the FIFA World Cup. However, over the years, these teams managed to reach the top national competition. In both cases, the stadiums achieved utilization rates higher than the predictions made by Play The Game. In Table 1, a progressive increase in stadium utilization can be observed, considering the seasons played between 2015 and 2022. Castelão hosted one of the highest numbers of games in the entire sample (193), surpassed only by Maracanã (254) and Mineirão (203). Coincidentally or not, the stadium was one of the four that exceeded the average presented by the World Stadium Index.

The use of Olympic stadiums

Brazil had the two stadiums (Engenhão and Arena do Grêmio) that were not selected for the FIFA World Cup but were mentioned by the Danish institution as potentially achieving better utilization, the study also collected data on their utilization following the same methodology applied to the stadiums used in the World Cup. Since Engenhão was deactivated in 2013, one year after Play The Game's predictions were published, the study considered data from Arena do Grêmio. Table 4 presents the utilization indexes for both stadiums between 2015 and 2022.

Table 4: Relationship between the annual attendance and the total capacity of the stadiums

Stadium	Attendance in each year/ World Stadium Index						
	2015	2016	2017	2018	2019	2022	World Stadium Index (2015 – 2022)
Arena do Grêmio	8,8	10,1	12,3	12,3	14,4	9,8	11,3
Engenhão	4,4	4,6	9,9	8,5	8,5	10,4	7,7

Organized by the authors (2023).

According to the World Stadium Index calculation, both stadiums are still below the average presented by the other 47 indexed stadiums (13.4). However, within the national context, both infrastructures have a utilization index higher than that of five of the 12 stadiums used in the FIFA World Cup (Arena Pernambuco - 2.6, Arena Pantanal - 1.8, Estádio Nacional de Brasília - 1.2, Arena Amazônia - 0.6, Estádio das Dunas - 1.1). In Table 5, it can be seen what this value represents in terms of the number of games the stadium hosted and the average occupancy achieved.

Table 5: Average percentage occupancy of the public in stadiums not used in the FIFA World Cup

Stadium	Capacity	Attendance average 2015-2022	Number of games (2015-2022)	Average Percentage of Stadium Occupancy
Arena do Grêmio	55.662	24539	157	44,0%
Engenhão	45.000	15133	146	33,6%

Organized by the authors (2023).

Regarding the number of games, the stadium hosted, it can be observed that both Arena do Grêmio and Engenhão had a similar number of games as Arena da Baixada and slightly more than Castelão, both of which had a utilization index higher than the average presented by the World Stadium Index. Regarding the average percentage of stadium occupancy per game, only Arena do Grêmio managed to surpass the average presented by the other Brazilian stadiums (42.6%). Finally, Table 6 presents the variations in national competitions played by the home teams in the two stadiums that were not used for the FIFA World Cup.

Table 6: Competitions played by the home teams in the stadiums not used in the FIFA World Cup.

Stadium	Club	Division - Year					
		2015	2016	2017	2018	2019	2022
Arena do Grêmio	Grêmio	A	A	A	A	A	B
Engenhão	Botafogo	B	A	A	A	A	A

Organized by the authors (2023).

It can be observed that both teams experienced contrasting processes regarding their position in the national championship. While Botafogo managed to ascend and remain in the top division, Grêmio remained in the top division for most of the time, being relegated only in 2021. When considering the data from Table 4, it can be seen that the utilization index at Engenhão increased over the years, while Arena do Grêmio experienced a decrease in the last season considered in the temporal cutoff.

“Legacies” of the Brazilian World Cup according to other studies

The legacies and potential impact left by the FIFA 2014 World Cup in Brazil, were analyzed through academic studies since 2014. Regarding the expenses incurred for staging the spectacle, studies pointed out that the 2014 edition was the most expensive one. According to Santos, Gaffney, and Ribeiro (2015), the feasibility of the World Cup depended on the direct application of financing resources, loans, the development of distinct bidding rules, and tax exemptions, most of them derived from Brazilian public funds. Despite the proposal submitted by the Brazilian Football Confederation (CBF) to FIFA in the dossier in 2007, estimating stadium expenses at R\$1.9 billion, Lois's study (2022) reveals a series of documents indicating discrepancies in numbers post-event, such as reports from the Federal Court of Audit pointing to expenditures in the range of R\$25.5 billion, while reports from the Ministry of Sports disclosed figures that reached R\$27.1 billion (LOIS, 2022, p. 7).

Despite these records on the expenses of the edition hosted by Brazil, the author also noted through FIFA's financial report that the World Cup cycle in the country (2011-2014) generated revenue of \$5.7 billion for the entity, surpassing previous editions (South Africa: \$4.1 billion; Germany: \$2.5 billion). These data might not have represented a problem if all promises of legacies had been fulfilled; however, allegations of irregularities led to actions by oversight and control bodies in Brazil.

In 2015, the Federal Police launched "Fair Play" operation due to suspected overpricing in Arena Pernambuco. In 2016, the Federal Public Prosecutor's Office (MPF) pointed out corruption in construction in Rio de Janeiro. In 2017, the Attorney General's Office forwarded whistleblower testimonies from Odebrecht employees regarding irregularities in half of the tournament's stadiums. In 2019, the Administrative Council for Economic Defense (CADE) initiated a process to investigate cartel formation in the construction of eight arenas (LOIS, 2022, p. 8).

One of the factors that drew attention to this type of problem was linked to urban mobility projects. The allocation of public funds for investment in social mobilization was a central theme in the discussion surrounding the World Cup in Brazil; however, what was observed in the following years did not align with the initial plans (LOIS, 2022, p. 18).

In light of these results, it is evident that "the characteristics of interventions vary among host cities, ranging from interventions with some metropolitan scope to cities that had absolutely no promised legacy" (RODRIGUES, 2015. In. SANTOS, GAFFNEY, RIBEIRO, 2015, p. 121). The same does not apply to private financing of hotel and airport networks, which, in general, benefited from the event, as observed in the terminals of Brasília (Federal District), Viracopos and Guarulhos (São Paulo), and Cofins (Minas Gerais) (LOIS, 2022).

In addition to the problems related to financial aspects surrounding the World Cup FIFA 2014, other factors are also associated with the difficulties encountered in the event's preparation phase. There are questions and gaps related to delays or incomplete works (MOORE, 2017; PILATTI, 2023), the redirection of funds away from health and education (BUTLER; AICHER, 2015), and cases of corruption in stadium bidding, including Arena da Amazônia, Arena das Dunas, Arena Pernambuco, Castelão, Fonte Nova, Mané Garrincha, Maracanã, and Mineirão (CHADE, 2015). Notably, between 2009 and 2015, the Federal Public Prosecutor's Office organized a task force to oversee the allocation of federal funds, conducting operations such as "Panatenaico" for the Mané Garrincha stadium, "Mão na Bola" for the Arena das Dunas, and "Cartão Vermelho" for the Arena Fonte Nova (PILATTI, 2023).

In academic circles, comparisons are also made between the hosting of the FIFA World Cup and other mega-sporting events in Brazil in the 21st century. Studies on the 2007 Pan American Games, considered a test event for larger upcoming events, found that some of the goals set before the games were not met. Issues regarding the construction of the Pan Village, the Autódromo complex, João Havelange soccer stadium, and security measures that led to operations in the Complexo do Alemão, among other cases, were evident (BENEDICTO, 2008). Challenges related to the removal of socially vulnerable communities, the high concentration of facilities in specific areas of the city, real estate speculation, and urban conservation conflicts are also highlighted. All these factors could be seen as contributors to a negative legacy for mega-sporting events in Brazil, and it was expected that these problems would be identified and, consequently, avoided by the organizers of subsequent mega-events (MIAGUSKO, 2012).

Regarding the period after the FIFA 2014 World Cup, considerations about the "Sports Legacy" theme do not emphasize satisfactory outcomes. Different studies reveal that the legacy left by the stadiums can be influenced by various factors, such as the presence of home clubs in elite competitions (REIS; COSTA; TELLES, 2021), the extent of community involvement, and the location of infrastructure implementation (NOBRE, 2017). The combination of these factors results in an annually fluctuating average attendance. Furthermore, among the findings in this study, it was noted that stadium occupancy within the analyzed time frame does not correspond to the facilities' seating capacity, leading to economic viability issues due to the low profitability of Brazilian arenas, creating a phenomenon some authors refer to as the "White Elephant Syndrome" (MOLLOY; CHETTY, 2015; BARROS, 2016).

Conclusions

The preliminary data indicate that, in general, there was coherence between the predictions developed by Play The Game regarding the utilization of Brazilian stadiums after the 2014 FIFA World Cup and the reality found in this study in terms of the dimension of sports events. The main limitation encountered in this study is the lack of data on the utilization of some stadiums in specific seasons. Additionally, the scenario caused by the COVID-19 pandemic prevented the inclusion of seasons played between 2020 and 2022.

Among the 12 stadiums considered in the sample, the majority (7) achieved better utilization than expected by the Danish institution, with 4 of them exceeding the average presented by the World Stadium Index. However, the predictions regarding the stadiums that would potentially rank lower in the index were also confirmed. Two stadiums that could have been used in the FIFA World Cup but were not selected achieved utilization rates higher than some of the stadiums involved in the event. Furthermore, there are indications that the level of competition played by the home teams may influence this process