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RESEARCH ARTICLE



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An Assessment of the World Experience and of the Characteristics of the Transport Infrastructure of Cities that Have Hosted the Soccer World Cup

¹ Evgeniya V. Vidishcheva

² Dmitriy S. Ageenko

¹ Sochi State University, Russian Federation
26a, Sovetskaya st., Sochi city, 354000
PhD (Economy), Associate Professor
E-mail: evgenia-vv@mail.ru

² Sochi State University, Russian Federation
26a, Sovetskaya st., Sochi city, 354000
PhD student
E-mail: dmitry.ageenko@gmail.com

Abstract

This article features an analysis of the world experience and of the characteristics of transport servicing of large-scale world soccer tournaments, conducted with a view to identifying potential bottlenecks in transport infrastructure, determining the necessary amount and types of transport vehicles engaged in transporting World Cup visitors and participants, proposing recommendations on transport servicing, and helping to take timely measures to make relevant adjustments as part of staging a portion of the 2018 FIFA World Cup in the city of Sochi. The experience of staging the Sochi Winter Olympics will help use the city's existing transport infrastructure as effectively as possible. Among some of the most crucial conditions for the success of staging a large-scale event are the availability of sufficient territorial space for the unimpeded and safe movement of large masses of people around the stadium and the stadium's proximity to the key elements of transport infrastructure, as well as to hotels and the heart of the city's social and commercial life. What complicates the transport planning of major soccer events is the tough-to-predict nature of transport traffic due to the movement of both the national teams and the fans and the highly uneven volumes of passenger and freight traffic during the event. This provides a rationale for instituting additional requirements for the traffic capacity of transport infrastructure, its reliability, safety, and efficiency on the whole.

Keywords: transport; infrastructure; soccer World Cup; sports; tourism.

Introduction

The 2018 World Cup will be the first soccer event of this kind of level for Russia, and staging it will involve large volumes of the passenger transportation of fans, official delegations from participating countries, FIFA officials, and the teams, with the event to be staged in 11 host cities. One of these cities is the city of Sochi with its "Fisht" stadium [2, 8, 13, 15, 16, 19].

The timely and quality preparation of transport infrastructure and ensuring the comfortable, swift, and safe movement of event visitors and participants is one of the major conditions for the successful staging of any large-scale, mass sports event. Traditional planning, in most cases, does

not serve as an independent type of activity but is a part of various works and projects. What complicates the transport planning of major soccer events is the tough-to-predict nature of transport traffic due to the movement of both the national teams and the fans and the highly uneven volumes of passenger and freight traffic during the event. This provides a rationale for instituting additional requirements for the traffic capacity of transport infrastructure, its reliability, safety, and efficiency on the whole.

Methods

This study is based on specific methodological and theoretical research into issues related assessment of the world experience of the characteristics of the transport infrastructure of cities that have hosted the soccer World Cup. Analysis of the world experience and of the characteristics of servicing large-scale world soccer events helps identify potential bottlenecks in transport infrastructure, determine the necessary amount and types of transport vehicles engaged in transporting World Cup visitors and participants, propose recommendations on transport servicing, and take timely measures to make relevant adjustments.

The objective in the authors' analysis is to identify cities and stadiums that over the last ten years have hosted some of the games of major soccer tournaments and have characteristics similar to those of the city of Sochi with its "Fisht" stadium.

Results

There have been 3 soccer World Cups staged over the last 10 years. In 2006 the World Cup was held in Germany, in 2010 in South Africa, and in 2014 in Brazil. In each of the tournaments, the games were played in several cities at 10-12 stadiums. The major criteria affecting the initial choice of host cities and stadiums for the authors' analysis were the stadium's capacity, its geographic location within the city, the size of the city's or agglomeration's population, and the organization of transport infrastructure in terms of servicing the stadium. The authors picked for analysis cities and stadiums that are similar to the city of Sochi and its "Fisht" stadium based on the maximum amount of criteria or are of interest for investigation in terms of applying the successful experience in the future – or, on the contrary, in terms of preventing errors in working out the concept of transport support. As a result, the authors picked cities in each of the above three countries, which the authors subjected to thorough analysis.

For comparative analysis, the assessment criteria were divided into 8 sections:

- general information about the city, including information about the population;
- information about the stadium, including the characteristics of its location, its capacity, and data on stadium entrances for spectators;
- information about the venue for the fans festival (the fan-zone), including its capacity, distance from the stadium, and transport support;
- data on the accommodation of visitors and places of residence of the city's residents from the standpoint of providing a transport link to the stadium;
- information about external transport used to transport the fans to the host city from other countries and move them between cities;
- transport support for the stadium within the city, including the types of transport, their carrying capacity, any impossible traffic restrictions, and transport accessibility for disabled people;
- organizing the "last kilometer", including the proximity of transportation hubs to the stadium and the time it takes to cover the distance;
- providing parking space for the individual transport of fans and client groups at the stadium.

Table 1: An analysis of transport solutions and infrastructure in cities that have hosted soccer World Cups

	1	2	3	4	5	6	7
Venue							
Country	Brazil	Brazil	South Africa	South Africa	Germany	Germany	Russia
City	Porto Alegre	São Paulo	Port Elizabeth	Nelspruit	Frankfurt	Hanover	Sochi
Population	1,500,000	11,900,000	310,000; the agglomeration: 1.5 million	60,000; the region: 4 million	700,000	520,000	473,000
Stadium							
Name of stadium	Estádio Beira-Rio	Arena Corinthians	Nelson Mandela Bay Stadium	Mbombela Stadium	Commerzbank Arena	AWD-Arena / HDI-Arena	Fisht
Location	On the coast, 3.5 km from the city's historical center	The eastern densely populated edge of the city	In the city's center, on the bank of a large lake	7 km from the city's center	In the south of the city, 5 km from the center	1.5 km from the city's center, on the bank of a lake	On the coast, 25 km from the city's center
Capacity	51,300, incl. 5,000 VIP seats	68,000 (20,000 added for the WC), incl. 10,000 VIP seats	48,500 (4,000 added for the WC), incl. 1,500 VIP seats	43,500, incl. 3,500 media + VIP seats	48,000, incl. 3,000 VIP seats	43,000, incl. 1,600 VIP seats	45,000
Number of entrances	130 turnstiles, 7 entrances, 2 ramps	120 turnstiles, 12 entrances, 2 ramps	64 turnstiles, 3 entrances, 4 ramps	85 turnstiles, 8 entrances, 8 ramps	5 entrances, 1 ramps	42 turnstiles, 5 entrances,	4 entrances, 3 ramps
Total evacuation time	8 minutes	8 minutes 8 seconds	Less than 8 minutes	4-5 minutes	n/a	n/a	n/a
Fan-zone							
Location	An open green space on the coast	A large area in downtown	A cricket stadium in the city's center	Outside the city's borders, a large festival zone	In the city's center, on the bank of the River Main (screens on the water)	In the city's center, near the stadium	n/a
Distance from the stadium	2.5 km	20 km	5 km	5 km	5.5 km	1 km	n/a
Capacity	20,000	30,000	25,000	30,000	15,000	20,000	35,000
Transport to the stadium	City buses; by foot	2 subway stations	Shuttles to the stadium	Shuttles + individual vehicles	2 subway stations, tramcars	By foot	n/a

Accommodation							
Locals Mostly at a distance from the stadium		In the vicinity of the stadium – 4 million, roads and public transit available	Even accommodati on on all sides of the stadium	At a distance from the stadium	At a distance from the stadium (public transit, cars)	Mostly to the north and east of the stadium	At a distance from the stadium (public transit, cars)
Visiting fans	Room supply: 20,000	Room supply: 42,000	Over 100 hotels + a cruise liner	32 hotels	Over 250 hotels	Over 160 hotels	Room supply: 64,000
External transport							
Air transport	An airport 15 km from the stadium	An airport 21 km from the stadium	An airport 21 km from the stadium	An airport 20 km from the stadium	An airport within 5-10 minutes driving distance of the stadium	An airport 12 km from the stadium	An airport 10 km from the stadium
Surface transport	Coaches (journeys up to 11 hours long; a bus station in the city's center)	Coaches	Cars and trains	Coaches, trains, and cars	Cars and trains	Cars and trains	Cars and trains
Transport to the stadium							
Public transport at-ion to the stadium	14 bus routes (designated corridors, 2 stations); a pedestrian route (3.5 km from the center, 2.5 km from the fan-zone)	2 subway stations, trains with a capacity of 1,600 passengers running every 85 seconds + a fast train = 114, 000 passengers per hour; + 61 bus routes	Designated bus lines: BRT (24 units), city buses (60 units), fixed-route taxis (160 units), a rail line	Designate d lanes for high-capacity transport, shuttles and fixed-route taxis (600 units)	3 commuter rail routes (every 10 minutes), 2 tram routes (every 3 minutes), 2 bus routes (every 10 minutes)	2 commu ter rail stations (4 routes), 2 bus routes; a pedestria n route from the city's center	2 rail stations, currently 4 bus routes (984 passengers per hour)
Time for clearing the area of the crowd after the end of the match	n/a (based on reviews, the bulk of the visitors would walk towards the city's center)	Within 30 minutes by rail	n/a	n/a	n/a (leisure activities are provided at the stadium for the fans for 0.5-2 hours after the match)	n/a	

Regular traffic restriction -s	Closing half of the city's main arterial road in front of the stadium for pedestrian -s	Closing the access roads to the stadium for unaccredited vehicles	A large zone of limited traffic in the vicinity of the stadium for unaccredited vehicles	Around the perimeter of the stadium; on the day of games, access is granted only to accredited vehicles	There are no restrictions; there are autobahns running near the stadium; the traffic is dense	Closing the streets adjacent to the stadium 3 hours before the kickoff and for 1 hour after the end of the match	A pure security zone around the Olympic Park, Olympic lanes, transport accreditation*
Servicing disabled people	Rides to the stadium from special parking lots for the disabled (450 spaces) + from 17 spots in the city	Free "door-to-door" rides to the stadium entrance in special cars	10 special cars for "door-to-door" rides + rides from a special parking lot	Parking for the disabled at the stadium	Parking for the disabled inside the stadium (58 spaces)	2 parking lots for the disabled near the stadium (50 spaces)	Free rides to the stadium entrance in special cars *

The last mile

Distance from the transport at-ion hub to the stadium	1-2 km to the nearest stops on days of games	900 m to subway stations on two lines and to a railroad station	500 m to 1.3 km to a railroad station	200-400 m to a bus station	700-1,300 m to a railroad station and a tram, 500-2,000 m to car parking lots	400-700 m to railroad stations	1.5 km to a railroad station and a bus station
Walking time	20 minutes	15-30 minutes	up to 30 minutes	10 minutes	10-15 minutes	5-10 minutes	20 minutes

Parking lots

Individual transport	At the stadium: 5,500 spaces (a parking lot for 3,000); Park-n-ride: 4,500 spaces	At the stadium: 1,950 + inside the stadium 900 + at the nearest shopping mall: 2,200 spaces	At the stadium: 1,280 + inside the stadium: 500; 5 Park-n-ride/walk zones for ~3800 spaces	At the stadium: 4,500 (not for all spectators); 7 Park-n-ride/walk zones for 13,500 persons	Inside the stadium: 1,800 spaces; paid parking in the vicinity of the stadium; 8 minutes driving distance by public transit	Paid parking around the stadium	Parking at the stadium for accredited transport and VIP guest transport *
Client groups	Parking at the stadium	Inner parking + near the stadium	Inner parking + near the stadium	Around the stadium	Inside the stadium	Inside the stadium	Parking at the stadium

* The data has been compiled on the strength of the experience of staging the XXII Olympic Winter Games-2014 in the city of Sochi



Figure 1. Porto Alegre, Estádio Beira-Rio, Brazil



Figure 2. Sao Paulo, Arena Corinthians, Brazil



Figure 3. Port Elizabeth, Nelson Mandela Bay Stadium, South Africa

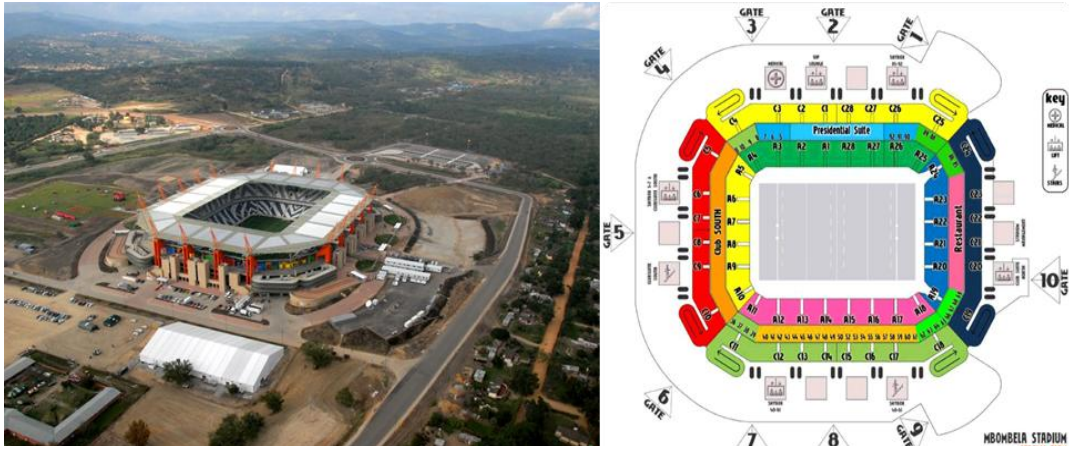


Figure 4. Nelspruit, Mbombela Stadium, South Africa



Figure 5. Frankfurt, Commerzbank Arena, Germany



Figure 6. Hanover, AWD-Arena, Germany

General inferences and recommendations

The findings of the authors' analysis of transport support for large-scale soccer tournaments, along with the experience of staging the XXII Olympic Winter Games-2014 in Sochi, help formulate a number of recommendations that could be worth following when making decisions on transport infrastructure and organization [1,3,4,5,7,8,9,10].

Among some of the most crucial conditions for the success of staging a large-scale event are the availability of sufficient territorial space for the unimpeded and safe movement of large masses of people around the stadium and the stadium's proximity to the key elements of transport infrastructure, as well as to hotels and the heart of the city's social and commercial life [6, 11, 19, 20].

Organization of public transit

The FIFA is orienting the organizers of soccer World Cups towards the implementation of a program called "Green Goal", which is targeted at environmental protection and aimed at increasing the share of public transit in servicing FIFA matches and creating a more effective energy-saving system of staging an event on the whole.

In cases when the stadium is considerably far from the areas of mass residence of fans and city residents and when the stadium is located inside a highly populated city, the most optimum option is a combination of fast rail transport (the subway, commuter trains) and high-capacity city surface transport (buses, including shuttles). That said, when it comes to this type of transport, it becomes crucial to organize designated lanes throughout the route to the key sites and zones (the airport, the city center, the fan-zone, residential clusters for fans and visitors). A system of this kind, in combination with accrediting and restricting the movement of personal transport, has already been applied in the city of Sochi – during the XXII Olympic Games-2014. It would be expedient to have several transportation hubs on different sides of the stadium, which will help to evenly distribute the arriving fans and reduce the time it takes for the fans to leave the stadium after the game. To this end, depending on where the stadium entrance nearest the fan's seat is located, the ticket could specify the recommended, most convenient type of transportation to use to get to the stadium. When it comes to Sochi's "Fisht" stadium, due to its geographic location (there is the sea on one of its sides), there are only two transportation options that would work: the "Olympic Park" passenger rail and bus hub and the second station, "Olympic Village", as well as adjacent parking lots for additional shuttles and bus stations.

Another important aspect in unburdening the transportation network could be the creation of a network of direct routes from the key sites and zones (the airport, the city center, the fan-zone, and rail and bus terminals), which would save one the trouble of having to make transfers along the way – just like it is done with shuttles, without interim stops.

Organization of access for individual transport and placement of parking lots

Considering that a FIFA World Cup, just like any other major sports event, has its client groups, any movement of transport around the stadium associated with spectators and fans is different from the flows of those working for the FIFA or their interaction is minimized.

Parking outside and inside the stadium is arranged only for special groups (VVIPs, VIPs, the press, disabled persons, etc.). Parking zones are fenced and are normally outside the stadium's external security perimeter.

A highly critical and sensitive aspect of transport planning and management of access is developing parking management policy, creating corridors and zones for temporary restriction of parking, creating "park and go" and "park and ride" systems, and using existing parking lots in effective ways.

Parking for fans, when there is room to accommodate (in line with relevant requirements and proportionally with the stadium's capacity) a sufficient number of parking spaces, is organized within the walking distance of the stadium, including the use of existing parking lots on the grounds of nearby public facilities like shopping malls. In the event there is no room available for the parking of individual transport, parking lots located outside the walking distance of the stadium could be used, and shuttle buses could be used to transport the fans.

To ensure access to the stadium for disabled people (wheelchair users), there are parking spaces provided right inside or near the stadium and there is a special individual service, “door-to-door”, ordered upfront.

Traffic restrictions

Aside from the mandatory restricting and suspending of traffic within the stadium’s prescribed perimeters during the event, the movement of individual transport is restricted on several streets and roads with a view to organizing designated lanes for public transport, as well as, if need be, with a view to ensuring pedestrian movement with a high flow intensity.

Placement of the venue for staging the fans festival (the fan-zone).

In most cases, the fans festival is held at a distance from the stadium (1 to 20 km). The venue is connected to the stadium through either existing routes for city public transit or shuttle buses specifically provided during the event.

Organization of the “last mile”

When it comes to transporting large amounts of people to restricted areas, of special significance is the organization of pedestrian flows and creation of the so-called “last mile” (the pedestrian space from the disembark zone to the stadium), as it reduces, time- and space-wise, peak loads on the transportation system. These measures help ensure fluent pedestrian movement and are a critical factor in ensuring safety in case of a panic situation.

Depending on the geographic location of the stadium and available territories, the distance between the transportation hub and the stadium entrance varies from 0.2 to 1.5 km. A greater distance helps ensure greater diffuence in the flow of pedestrians moving towards the transportation hub after the end of the game, which reduces the load on the transportation hub, facilitates an even influx of passengers, and minimizes the risk of pedestrian jams and tussles. The pedestrian route should be completely barrier-less and should not cross paths with transport or other pedestrian flows on a single level. In the event of the route being considerably long, sufficient seating could be provided along the entire route from the stadium to the transportation hubs to let pedestrians rest. Also, given the positive experience of staging the Olympic Games, it would be worth organizing routes for the movement of electro-cars for senior visitors, visitors with children, and disabled visitors across the Olympic Park.

Conclusion

The authors’ recommendations, which could be worth following when making decisions on transport infrastructure and organization, could help make the most effective use of the transport infrastructure that has already been put together and utilized in the city of Sochi – during the XXII Olympic Games-2014.

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