O papel da galvanização nos estádios sustentáveis

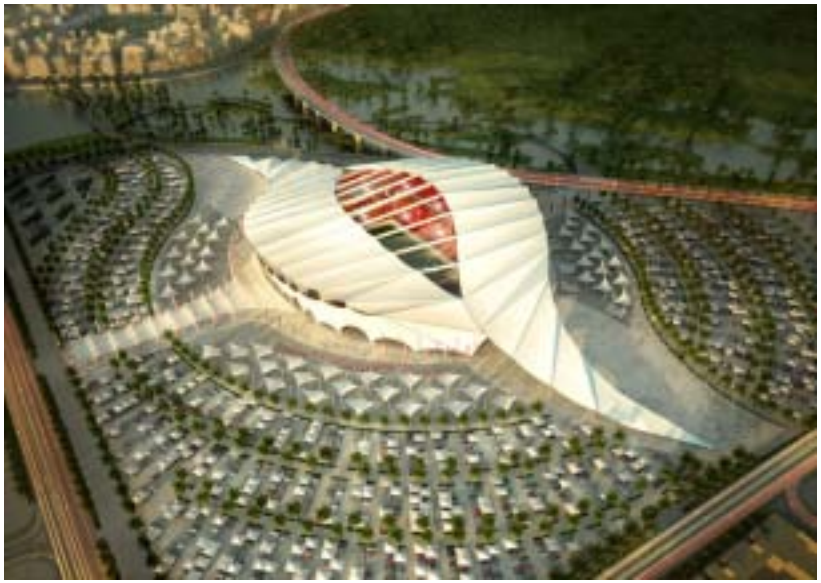
The role of galvanizing in sustainable stadiums

Frank E. Goodwin
IZA

“Green retrofit” of Philadelphia football stadium

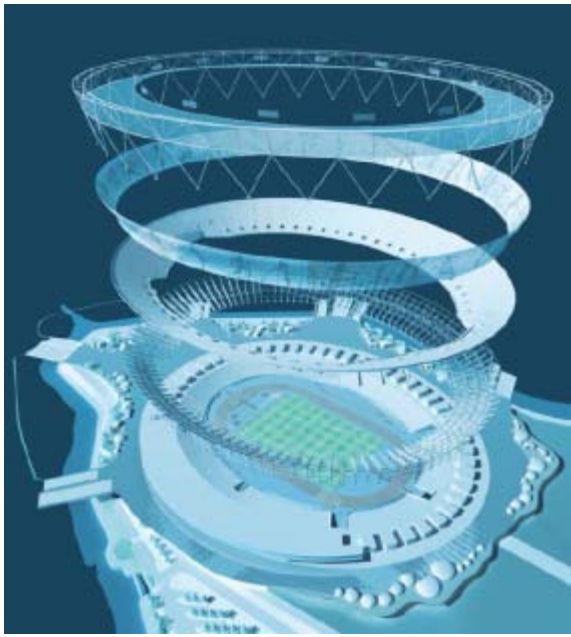
•25% of its power from 2,500 solar panels and 80 stadium-mounted wind turbines
•75% from on-site generator running on either natural gas or biodiesel
•Non-toxic cleaning materials
•Composting program and processing estimated 10,000 gallons of concession-generated grease and kitchen oil into biodiesel

Qatar 2022 Planning



- 3 new stadiums will be assembled using modular components for easy disassembly and transport to developing countries at the close of the games
- Solar Thermal Collectors and PV panels will power absorption chilling systems

London 2012 Olympics



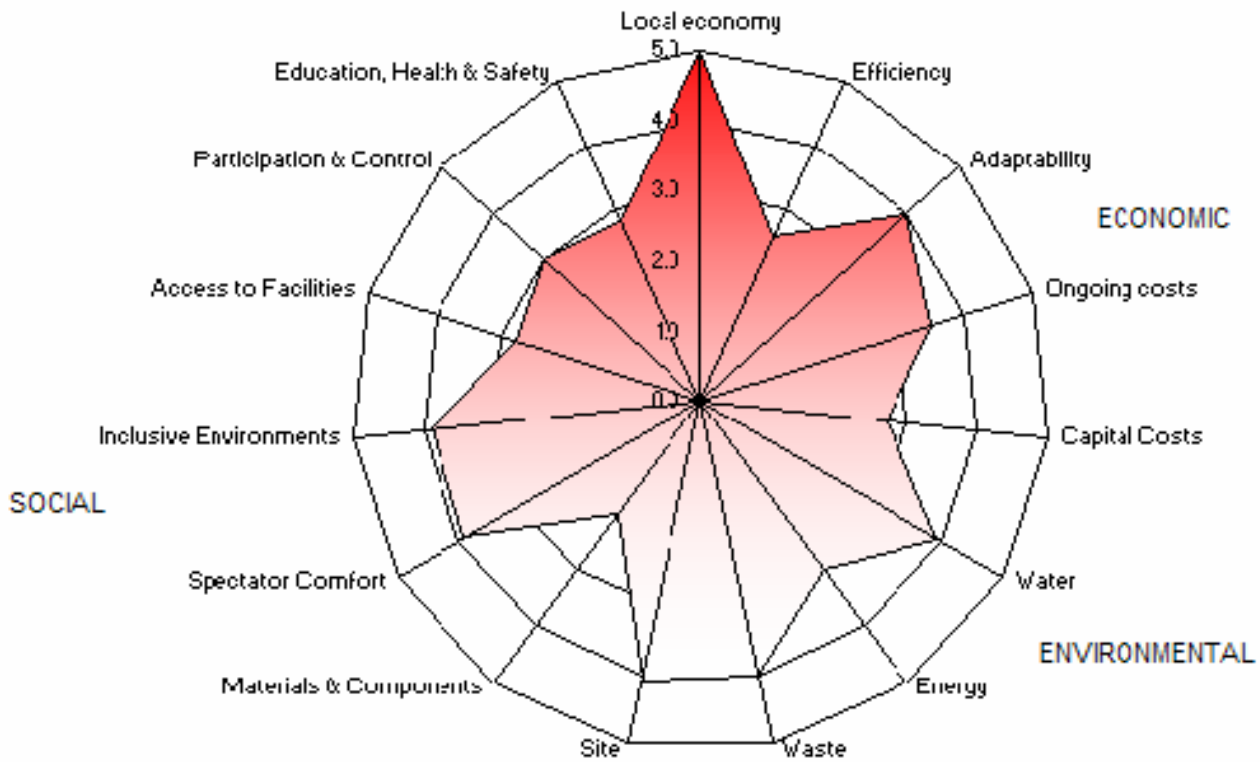
Much of the structure will be disassembled after the Olympics: 80,000 reduced to 25,000 seats
All cooking and toilets in outside structures

FIFA and Sustainability

FIFA shows its support for environmental protection with the "*Green Goal* " chapter in its specification manual "Football Stadiums: Technical Recommendations and Requirement"

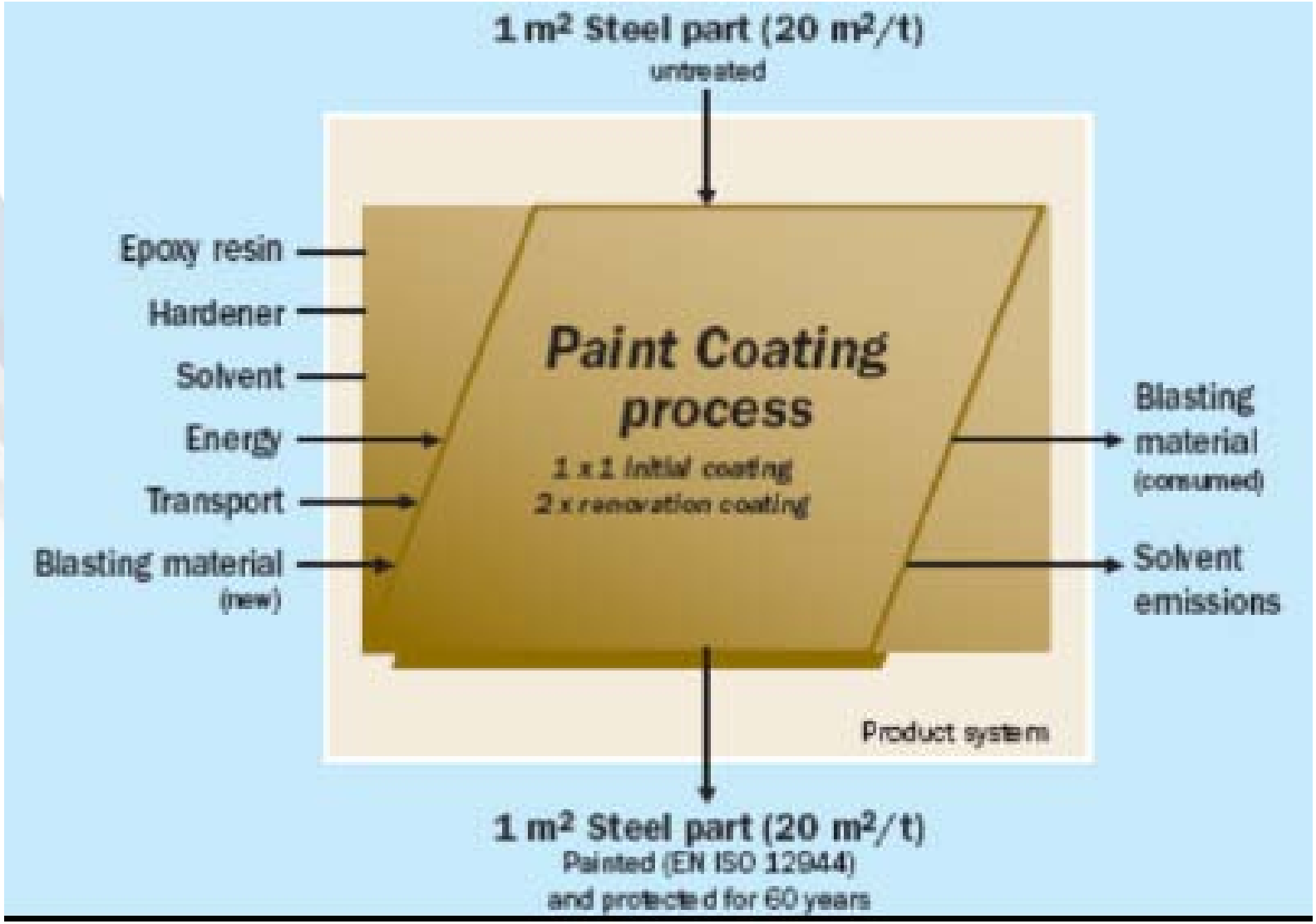
and the incorporation of *Environmental Protection* in the host city agreement with the FIFA World Cup Local Organizing Committee and the host city

Typical Results of Sustainable Stadium Assessment Tool

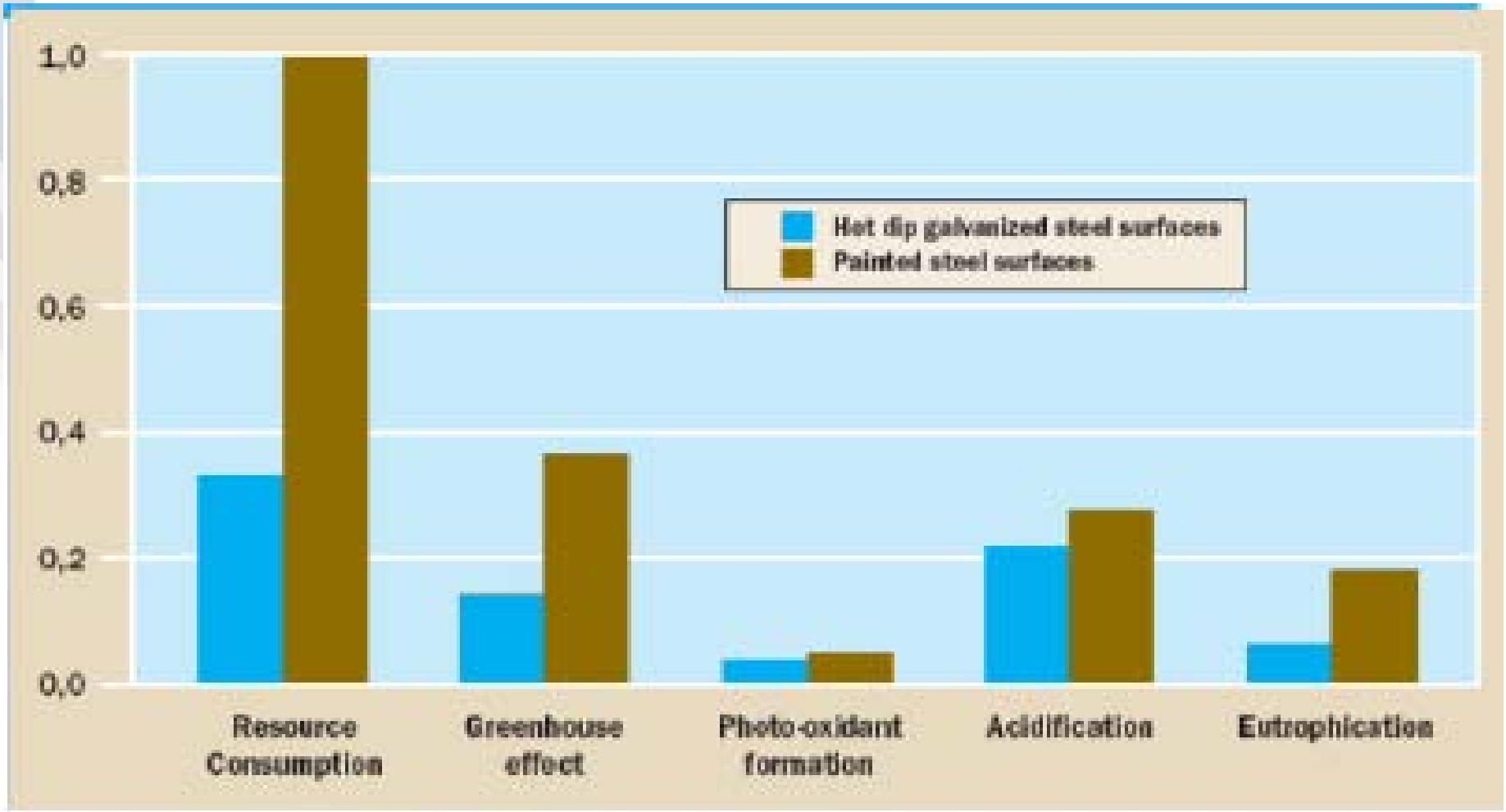


Economic	3.5
Environmental	3.4
Social	3.3
Overall	3.4
Classification	Good

Sustainability of HDG vs Painted Steel



Sustainability of HDG vs Painted Steel



Vauxhall Grandstand of Oval Cricket Ground, London

Originally built 1845

Replaced with 4-tier stand in 2006, combination of HDG sections

Prominent HDG “tusks” clad with stainless steel

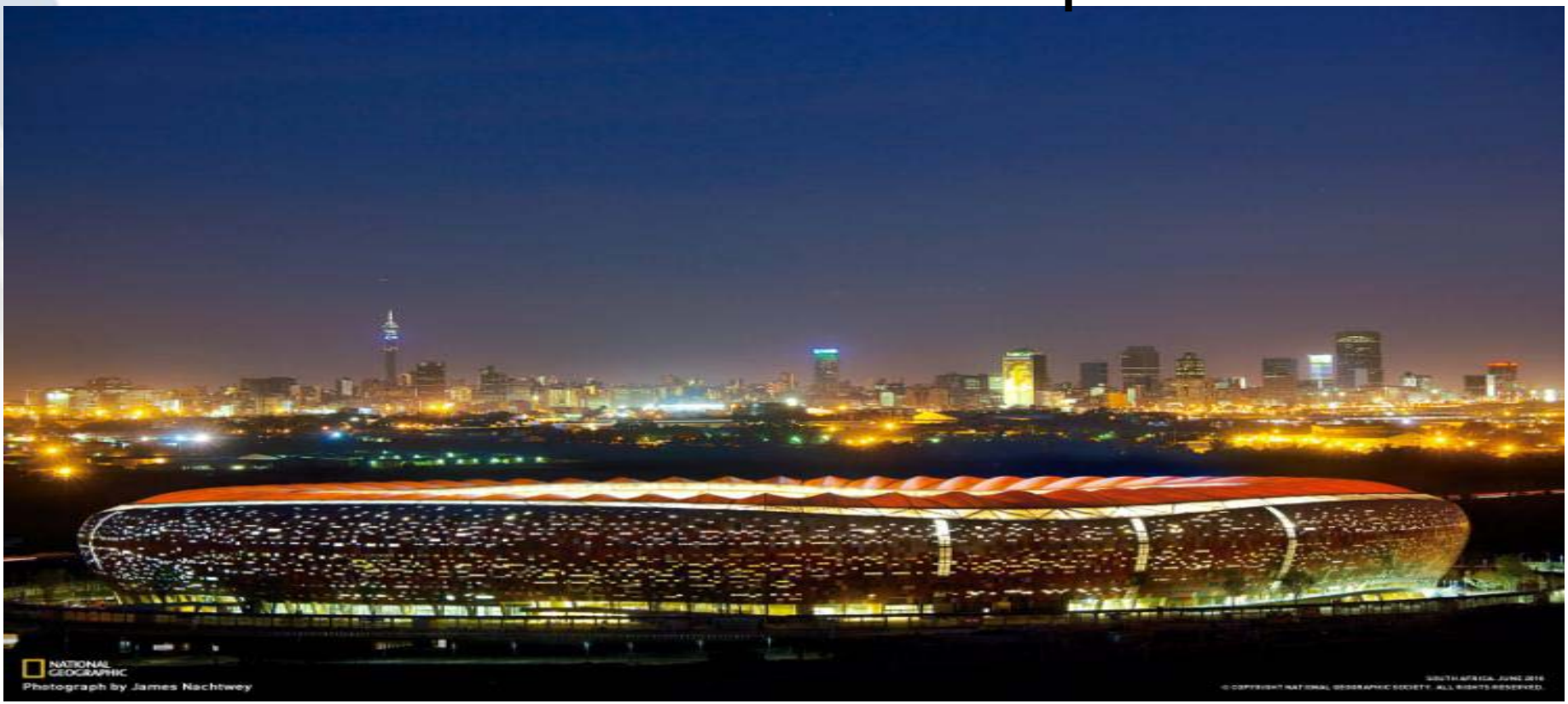
Hannover AWD Arena
50,000 seats

Upgraded for 2006 World Cup
Roofing system uses HDG for all exposed steel components

Sydney Olympics Tennis Stadium 2000

Shade provided for 70% of spectators
HDG used for entire lightweight steel structure

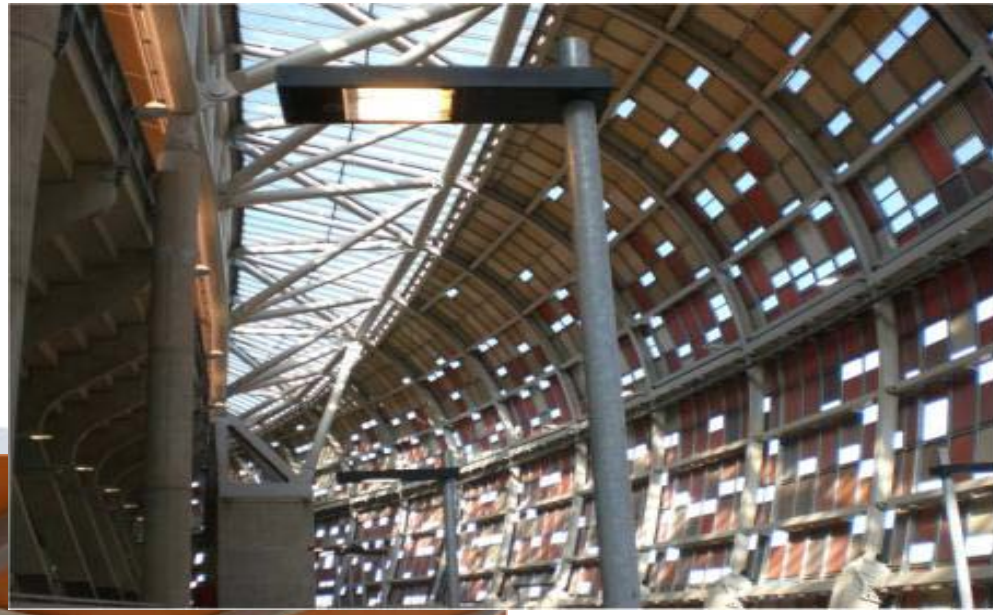
Soccer City, Johannesburg: Leading Stadium of 2010 World Cup



80,000 m^2 of concrete
8000 tons of structural steel
9000 tons of reinforcing steel

Soccer City Details

- 94,000 seats
- 280 tons of HDG for outer shell
- 150 galvanized turnstiles



Soccer City Details-2

- 150 tons of HDG handrailing
- All seating brackets HDG

CopaVerda Plan Brasil

- The CopaVerde Plan focuses on the 2014 FIFA World Cup and 2016 Rio Olympic Games and the green building certification of all of the stadiums, hotels, airports, hospitals and supporting infrastructure
- Together these could prove to be the largest, coordinate, green building effort to date

Highlights of CopaVerde Plan

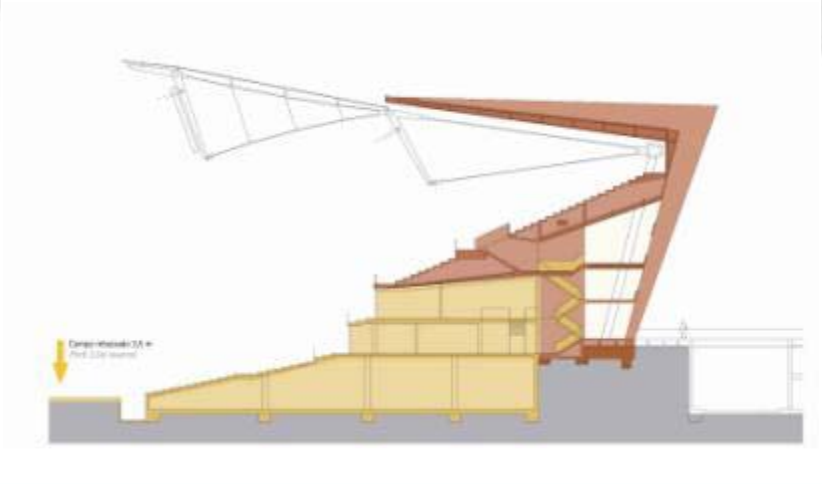
- Every stadium, sports facility or building to be utilized during the events should be Green Building certified
- Attaching "Green Bonus" financing terms, by the BNDES (Brazilian Development Bank) or other banks, tiered to the levels of LEED certification achieved
- Creating a local renewable energy project in each host city
- Launching a quest for the Brazilian electric car
- Finding an alternative jet-fuel mix for airplanes
- Taking carbon offset initiatives and help create the beginnings of 12 Green hosting the games)
- Creating a "Committee of the Games" chaired by a single individual, a "Czar of the Games," with the power and responsibility to deliver on these measures

The 12 Host Cities for 2014

Corrosion Severity in Brazil

Adapted from "Atmospheric Corrosion of Copper in Ibero-America" M. Morcillo, E. Almeida, M. Marrocos, and B. Rosales, Corrosion, Vol. 57, No. 11, pp. 967-980.

Belo Horizonte – upgrade
69,950 seats



Belo Horizonte Airport Terminal 2

2013 - PERSPECTIVA DO TERMINAL 2 DO AEROPORTO INTERNACIONAL TANCREDO NEVES - AITN

Proposta para estar em operação antes da Copa do Mundo

Brasilia Estadio Nacional – rebuilt
71,500 seats

Cuiabá- new Arena Pantanal
42,500 seats

Curitiba – to be upgraded
Arena da Baixada
41,375 seats

Fortaleza – upgraded 66,700 seats

Manaus – new stadium Arena Amazonia (Vivaldão) 50,000 seats

Natal – new stadium Arena das Dunas (Novo Machadão)

Porto Alegre (upgrade)
Estádio Beira-Rio
62,000 seats

Recife – new stadium Arena Pernambuco (Cidade de Copa) 46,160 seats

Rio de Janeiro – upgrade Estádio Mário Filho (Maracanã) 82,000 seats

Tension Cable Roof

Salvador –new Arena Fonte Nova 55,000 seats

Tension cable roof Architect – Brunswick, Germany. Built Hanover Stadium

São Paulo
Novo Estádio do Corinthians
65,000 seats