

# The Beautiful Game Blackened by its Carbon Footprint? The 2022 FIFA World Cup in Qatar.

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## **Abstract**

The 2022 World Cup organised by the International Association Football Federation (International Olympic Committee, 2021) and hosted by Qatar was billed to be the tournament that would completely revolutionise football, both on and off the field. It garnered acclaim in being the first World Cup held outside its customary months of June-July as well as in pioneering net zero carbon emissions in the sport - an assertion that ultimately proved largely unfounded (Ralston, 2022) with high reputational consequences for the country and the game. Non-governmental organisations (NGOs), like the Carbon Market Watch that work with the European Union amongst others claimed that “carbon emissions created by the new stadiums could be as much as eight times higher than the figures contained in Qatar’s analysis” (MacInnes, 2022). Against the backdrop of mounting sustainability concerns expressed by policymakers and enthusiasts alike, this essay examines the environmental hazards associated with major sporting events, like the 2022 FIFA World Cup whilst delving into adaptations that organisers could make for future sporting bonanzas that would give their green aspirations wings that could fly without getting burned like the fabled Icarus whose own pride and arrogance led him to ignore the rising temperatures and ultimately cause his demise.

**Key Words:** Climate Change, Global Warming Potential, Greenhouse Gas Emissions, Halocarbons, LGBTQ+ Community, Ozone Depletion, World Cup.

### **Acknowledgements:**

With thanks to my brother Dominic Lygdopoulos, a Biomedical Science student at the University of Surrey, who helped me research and understand the contribution of hydrofluorocarbons to global warming and the damage of hydrochlorofluorocarbons that deplete the Earth's ozone layer.

### **The Build-Up**

During Winter 2022, as fans witnessed their respective nations vying for victory in football's most prized tournament, it became increasingly challenging to overlook the resolute calls made by Western nations to uphold what they perceived as fundamental human rights, particularly matters pertaining to the rights of LGBTQ+ fans (Olley, 2022). This uproar and outrage overshadowed this tournament's much more profound and unequivocally negative impact on the world stage (Dadura, 2022).

To host this World Cup, Qatar faced significant challenges that demanded innovative solutions, like shifting the event to the winter months to protect players and spectators from the intense Middle East heat. Contrary to its promise to be 'carbon-neutral', this World Cup defied conventional wisdom regarding energy consumption, blowing up its budget with the installation of fossil-fuel powered air conditioning (AC). Whilst incorporating rich cultural elements in their design – like the sails of traditional dhow boats in a tribute to the Kingdom's seafaring past and the 'fanar' lantern from the Islamic world's golden age of art and craftsmanship – without domes, this gas-rich nation was obliged to cool seven stadiums that were open to the sky. Their AC units were remarkably powerful, to the point that some fans complained about feeling too cold and stewards on the sidelines donned jackets to ward off the blizzard-like breeze (Greenhill, 2022). The event's environmental impact was further amplified by the travel of around 3.4 million athletes, sponsors, and supporters (FIFA, 2022) to a Gulf Arab sheikdom that is normally home to 2.7 million inhabitants.

AC alone already accounts for a staggering 70% of Qatar's annual energy consumption (Ataullah, 2017) and predominantly relies on non-renewable energy sources (International Energy Agency, 2022). Before the event, FIFA estimated that the World Cup 2022 would result in the emission of 3.6 million tonnes of carbon dioxide (CO<sub>2</sub>), surpassing the 2.1 million tonnes produced during the 2018 tournament in Russia and exceeding the annual emission levels of 70 countries worldwide

The Beautiful Game Blackened by its Carbon Footprint? The 2022 FIFA World Cup in Qatar.

(Worldometer, 2019). Offset initiatives aimed at planting trees and grass in the desert were deemed "not credible" (Walker, 2022). Coupled with the indisputable emissions stemming from the extensive air travel involved, this provides incontrovertible evidence that the World Cup 2022 has left Qatar with a profound environmental footprint as its lasting legacy.

### **Environmental Effects of Air Conditioning: Greenhouse Gas Emissions, Global Warming Potential, and Ozone Depletion**

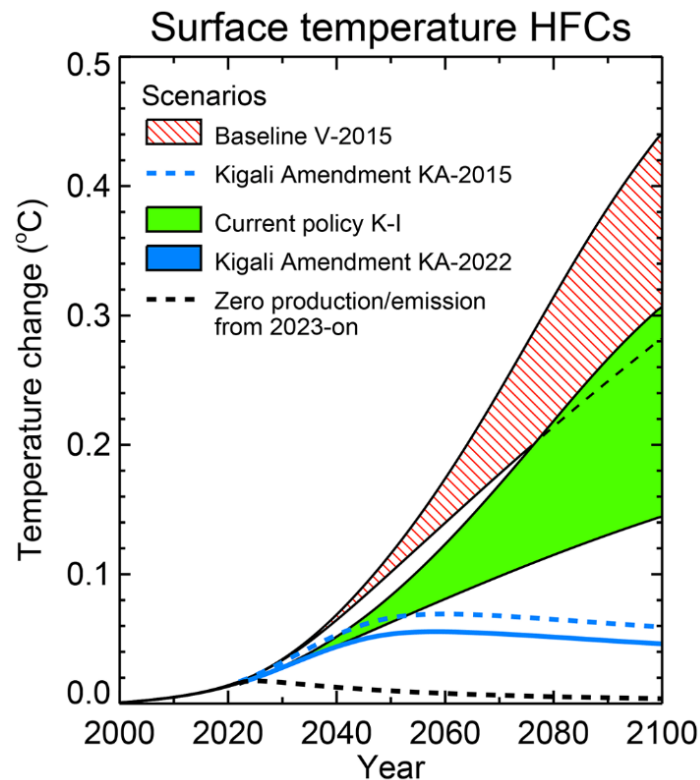
With its intensive energy requirements, the use of AC is associated with adverse implications for climate change and the environment (Brager *et al.*, 2015). AC contributes to increased greenhouse gas (GHG) emissions through heightened energy consumption and the atmospheric release of halocarbons, such as hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs). The formidable nature of GHGs emanates from their inherent "Global Warming Potential" (GWP). Frequently expressed as a relative value vis-à-vis 1 tonne of carbon dioxide, which serves as the reference with a GWP of 1, this quantitative metric is used to assess and juxtapose the efficacy of diverse GHGs in terms of their heat-trapping capacity within the Earth's atmosphere and consequent contribution to global warming over a 100-year period (United States Environmental Protection Agency, 2023).

Both HFCs and HCFCs possess staggering GWP. According to the Dutch National Institute for Public Health and the Environment (RIVM), the most commonly used HFCs have a GWP ranging from 150 to 5,000 times greater than that of CO<sub>2</sub> (RIVM, 2016). An HFC highlighted by (Tollefson 2010) exhibits an astonishing GWP, up to 11,700 times higher than that of CO<sub>2</sub>. This effectively means for every HFC molecule released, it will trap the equivalent amount of energy as 11,700 CO<sub>2</sub> molecules. Such a scenario can inadvertently establish a vicious cycle whereby escalating temperatures caused by HFC emissions necessitate increased AC usage to counteract the heightened heat.

Whilst there is evidence to suggest that HFCs have negatively influenced climate change, they are widely regarded as a 'greener' alternative for HCFCs (Utage *et al.*, 2021); notably because although HFCs do increase temperatures through trapping ultraviolet rays as visualised in Figure 1, they do not contain 'Ozone-Depleting Substances' (ODS), unlike HCFCs that release chlorine molecules into the stratosphere that destroy ozone molecules (Solomon, 2008). This phenomenon occurs due

to HCFCs' rise into the stratosphere, where they undergo degradation upon exposure to even more intense ultraviolet radiation. This triggers a catalytic cycle where chlorine atoms engage in reactions with ozone (O<sub>3</sub>), effectively appropriating a lone oxygen atom and yielding chlorine monoxide (ClO) (Solomon, 2008). Subsequently, this process is set into perpetual motion as ClO further disintegrates O<sub>3</sub>, resulting in the formation of two O<sub>2</sub> molecules thereby depleting the ozone layer (Solomon, 2008).

The dangers of depleting Earth's ozone layer are well-covered in the scientific and popular press alike, with increased exposure to ultraviolet rays causing genes to mutate, melanomas to grow lead to skin cancer, and cataracts that emerge and blind us (Adedoye & Aina, 2019). Recognising the seriousness of this situation, the United Nations Environment Programme (UNEP) took dramatic action by adding HFCs to the list of controlled substances and establishing a timeline for their gradual reduction. During the 28th Meeting of the Parties to the Montreal Protocol in Kigali, Rwanda, on 15 October 2016, its signatories agreed on the 'Kigali Amendment' with a goal to decrease HFC levels by 80-85% by the late 2040s (UNEP, 2017). Figure 1 below depicts the difference in temperature that will be seen if HFC levels decrease in line with goals set out by the amendment in line with UNEP estimates that the Kigali agreement will prevent the emissions of up to 105 million tonnes of carbon dioxide equivalent of GHGs.



**Figure 1:** Contribution of HFCs to the global average surface warming for the V-2015 baseline scenario without measures on HFC consumption and the current policy Kigali-independent (K-I) scenario. (Velders *et al.*, 2022)

### Environmental Consequences of Large Sporting Events: Insights from Qatar

In light of Qatar's 'carbon-neutral' promise, it is imperative to consider the FIFA World Cup 2022 Greenhouse Gas Accounting Report (FIFA, 2021) on the event. The GHGs emitted, along with their respective global warming potential (GWPs), encompassed not only well-established gases - like CO<sub>2</sub> (with GWP: 1), methane (CH<sub>4</sub> with GWP: 28), and nitrous oxide (N<sub>2</sub>O with GWP: 265), as well as halocarbons like HFC-134a (GWP: 1,300), HFC-407C (GWP: 1,624) and HCFC-22 (GWP: 1,760) (FIFA, 2021). Notably, these halocarbons possess the capacity to retain over 1,000 times more energy than CO<sub>2</sub> over a century. Of particular concern are HCFC-22 and HFC-134a, as they are widely used across the globe. Unlike HCFC-22, HFC-134a does not contribute to ozone depletion, but both of these substances have been found to significantly contribute to the growing levels of GHGs (Xiang *et al.*, 2014). This is especially concerning given this report's estimate that 99.5% of all emissions created during the tournament would occur during the games. This one-month extravaganza in Qatar generated emissions equivalent of about 2,712,177 tons of carbon dioxide equivalent (tCO<sub>2</sub>e). This estimation was derived from a need to cool a stadium, its drinks and people

The Beautiful Game Blackened by its Carbon Footprint? The 2022 FIFA World Cup in Qatar.

- which is actually 3-4 times the emissions (i.e.: 888,852 tCO<sub>2</sub>e) created in building the Qatari stadiums, hotels, and other infrastructure that will be used long afterwards (FIFA, 2021). More worrying is that this calculation doesn't include air miles travelled by fans, used by companies and display merchandise sold throughout this one month whilst the two primary halocarbons that were used will be trapping ultraviolet rays for another 13.8 years (HFC-134a) and simultaneously depleting the ozone layer for 12.1 years (HCFC-22).

Whilst Qatar presents a unique context that focussed attention on heat-related issues, it is not the first host nation to experience indirect environmental effects. Throughout modern history, our planet has witnessed significant global events that invariably attract worldwide attention. Consequently, even individuals who have not historically been avid sports enthusiasts express a desire to attend or organise such events, as exemplified by India's bid to host the 2036 Olympic Games.

So, in general, how bad is the World Cup for the environment? A comprehensive investigation of the environmental effects of major sporting events sheds light on the repercussions of the four editions of the World Cup held between 2006 and 2018 (Cerezo-Esteve *et al.*, 2022). The findings from this study reveal that out of the 16 discernible effects examined, a significant majority of 14 were determined to be negative. The detrimental consequences were particularly pronounced in South Africa and Brazil, where the construction of infrastructure resulted in the degradation of natural environments, loss of habitats, and a decline in biodiversity.

Following the 2010 World Cup in South Africa, visitors lodged complaints regarding the event's detrimental environmental impacts, which escalated pollution, heightened waste generation, consumed excessive water, degraded natural habitats, caused a loss of biodiversity and increased noise pollution (Govender *et al.*, 2012). Attuned to these concerns, the Brazilian organizers of the 2014 World Cup declared their intention to hold the first-ever 'carbon-neutral' event, supported by certification together with a plan to plant 1.4 million trees – believing such carbon offsetting would fulfil the requisite criteria. To date, a meagre 70,000 of the originally proposed trees have been planted. A far cry from promises made!

In assessing the 2000-2021 period, apart from the 2013 Africa Cup of Nations (AFCON) tournament hosted in South Africa, it is baldly apparent that football suffers from inferior

The Beautiful Game Blackened by its Carbon Footprint? The 2022 FIFA World Cup in Qatar.

planning and management, compared to other sports, as indicated by a cumulative Positive, Negative, Inconclusive score of 4-19-2 (Cerezo-Esteve *et al.*, 2023). The most frequently documented negative impacts were associated with heightened air pollution, inadequately formulated sustainability programmes, and the failure of organisers and promoters to assume environmental responsibility.

### **A Future Full of Systemic Irresponsibility?**

AC technology was implemented for the first time in the 2022 World Cup to mitigate challenges posed by high temperatures. This raises the question of whether other sporting events will follow suit, given the mounting scientific evidence that the planet is warming much faster than it has over human history. Whilst a couple of degrees may not seem like much, the 20 warmest years on record occurred within the 22-year period until 2018 (World Meteorological Organisation, 2018) and the past eight years have been the warmest eight years since the 1800s (World Meteorological Organisation, 2023). Qatar's choice to cool outdoor events carries major implications, as it may initiate a cascading series of events taking place in excessively hot climates, made feasible solely through extensive use of AC.

Since the early 2020s, there has been a discernible trend for prestigious sporting events like the Joshua vs. Ruiz boxing match, the UFC bout between "Khabib and Porier," or the football 'Club World Cup' to be relocated away from the traditional geographies, driven primarily by the substantial financial incentives associated with such ventures (Ingles, 2022). Consequently, domestic fans are compelled to traverse continents to bear witness to their team or athlete's triumph in these tournaments leading to a paradigm shift wherein it becomes not a matter of *if* but *when* the FA Cup final the Super Bowl or the NBA finals will succumb to the allure of the considerable economic rewards that accompany staging these events in far-foreign territories.

Should such a trend persist, the consequences to the global ecosystem are of significant concern. According to Our World in Data (2021), eight out of the top ten nations in terms of per capita CO<sub>2</sub> emissions are characterised by their oil-rich economies. In this light, there is a genuine peril that these nations, already responsible for a disproportionate share of GHG emissions, may prioritise entertainment pursuits over environmental preservation. It is crucial to recognise that the impact of global warming transcends geographical and cultural boundaries, affecting individuals

The Beautiful Game Blackened by its Carbon Footprint? The 2022 FIFA World Cup in Qatar.

irrespective of their national affiliations. Thus, a concerted international effort is vital to combat global warming, encompassing nations whose climatic conditions are more conducive to hosting events like the World Cup, as exemplified by Brazil, which had the honour of hosting the tournament in 1950 prior to its rendition in 2014.

There is an ongoing debate surrounding aspects of the 2026 FIFA World Cup, which is set to be hosted in North America. Proponents argue that it is crucial to take measures to prevent the event from becoming a significant source of excessive CO<sub>2</sub> emissions (Rawson & Rodgers, 2022). To address these concerns, event organisers are being actively encouraged to facilitate the adoption of environmentally sustainable technologies and demonstrate conscientious commitment to align with the targets of the 2015 Paris Agreement - the first-ever universal, legally-binding global agreement that set out a framework to avoid dangerous climate change by limiting global warming to well below 2°C. This proposition finds support in the research conducted by Richard Betts, the Head of Climate Impacts at the University of Exeter. Betts *et al.* (2011) concluded that failure to address these issues could result in a dire future scenario, characterised by a potential temperature increase of 7°C by the close of the 21st century. Betts' subsequent study (Betts *et al.*, 2018) revealed that human activities have already led to a 2°C rise in global temperatures during the period from 1981 to 2010.

### **Potential Solutions**

It is important to note that the discussion herein does not intend to imply that certain countries or regions should be excluded from hosting teams, football matches, or major sporting events. On the contrary - as the name suggests - the World Cup is designed to be a global event inclusive of all nations. However, it is pertinent to question the merits of pursuing such events solely as business ventures, rather than genuinely fostering a passion for the sport. Is it justifiable to compromise the environment and construct stadiums that may only be fully utilised for a month or a few days each year? Considering the moral implications: if an event can take place anywhere, is it essential for the designers to seriously consider the carbon footprint left behind once the event concludes?

An inequitable, albeit harsh resolution would entail temporarily barring certain nations from hosting the World Cup until their respective governments implement environmentally sustainable practices or until technological advancements enable significantly cleaner alternatives. Another



way forward could be to host training sessions underground. Unlike matches, there is no need for thousands of people to be present. Underground constructions are not only between 3-4°C cooler, on average than above-ground installations, but they use approximately 23% less energy (Alwetaishi *et al.*, 2021). This could be perceived as a greener approach for nations, like Qatar, which built its entire event from scratch. Such an approach would indeed mitigate the need for industrialised AC units throughout the training facilities. However, the problem of ventilation would still need to be solved. Athletes put their bodies under strenuous anaerobic conditions. They need substantial oxygen to recover from such exercise. Currently, the most effective way to adequately air underground spaces is through ventilation, powered by substantial amounts of energy. Could the most practical way forward be found in football's governing body FIFA taking leadership and advocating for change?

Presently, FIFA mandates the disclosure of carbon footprint projections by bidding nations seeking to host the World Cup; yet it largely neglects environmental considerations throughout the bidding process and subsequent to the tournament (Rawson & Rodgers, 2022). This raises the question as to why FIFA refrains from enacting regulations that would compel nations to uphold their environmental commitments. For instance, FIFA could require the Brazilian Football Association to continue funding the afforestation of 1.4 million trees, with potential sanctions on the national team or league in case of non-compliance. Such a show of teeth would surely incentivise domestic football associations to fulfil their obligations. Furthermore, FIFA could enforce a minimum financial investment in renewable energy resources by host nations. Considering that countries like Qatar experience prolonged periods of sunlight, the implementation of solar panels to power stadiums or AC systems would surely provide long-term advantages. This would mark a significant stride in the right direction, particularly given Qatar's heavy reliance on non-renewable fossil fuel sources in its energy mix and it would be a far fairer alternative than excluding countries from throwing their hat into the ring to host a future World Cup or other major sporting events.

### **The Beautiful Game**

Reflecting on the autobiography of perhaps football's greatest ever player "The King", Pele wrote: "I dedicate this book to all the people who have made this great game the beautiful game" (Pele & Fish, 1977).

The Beautiful Game Blackened by its Carbon Footprint? The 2022 FIFA World Cup in Qatar.

The beauty of the sport was that anyone could play it in any environment. This sentiment should continue. However, in the 21st century, with largescale awareness of the damage the World Cup brings to biodiversity, global warming, and the ozone layer, the environmental effects can no longer be ignored with impunity. To date, football's trajectory has adopted a highly dysfunctional anthropocentric approach that privileges entertainment over the environment. As ardent supporters of the sport, we must persist in our endeavours to restore the game's inherent beauty, for if we don't, soaring temperatures could soon melt the wax in the Beautiful Game's wings, causing a hideous descent towards disaster.

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The Beautiful Game Blackened by its Carbon Footprint? The 2022 FIFA World Cup in Qatar.

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