Dirty Tackle

the growing carbon footprint of football

In association with

Scientists for Global Responsibility

Contents

Foreword

Football finds itself offside in the face of the climate crisis. It is increasingly vulnerable to the extreme weather of a heating planet, and its large and growing carbon footprint is adding to the problem. The sport also unfortunately has become a global billboard for promoting heavily polluting products and lifestyles for some of the world's biggest emitters.

With each football season, the impact of the climate crisis on football has become impossible to ignore.

In May 2024, the Arena do Gremio stadium in Brazil was flooded. During the Copa America in June, players and referees suffered from heat and humidity. In English football, from the top to the amateur level, more and more matches are cancelled due to heavy rainfall. And, nobody could fail to see the result of devastating wildfires in Los Angeles, the city set to host games in the 2026 World Cup. Impacts like these are becoming more frequent and severe due to the burning of fossil fuels.

But these disruptions are only a small fraction of the daily impact of a changing climate on football. Think about the young girls and boys in the outskirts of Paris stopping play during the hottest hours of the day, missing the hours of fun and practice that grew so many of the legendary talents coming from their neighborhood. Or the communities in Nigeria who had to flee devastating floods in October 2024 and had to find temporary shelter far away from their flooded homes, schools and football fields. Every day, the smoke from burning fuels, extreme heat, floods, droughts and huge climate disasters stop or disrupt play and harm the health of players and fans.

This is the situation now – and if we don't take serious climate action, the future of football looks bleak.

This report gives us a clear perspective on where the world of professional football currently stands and where it needs to go. It is clear what the main sources of football's pollution are: travel for (international) matches, stadium construction and sponsor deals with polluting companies, who use football to advertise and thereby normalise their polluting products to billions of people. Together, this leads to emissions of around 64-66 million tCO_2e per year.

It means that just a single sport has about the same amount of emissions as a wealthy country like Austria , and around 60% more than those of the first nation to host the World Cup, Uruguay.

But the football community, with its enormous global reach and the example it sets, can play a leading and pivotal role in taking climate action, cutting emissions, changing consumption patterns, and securing a future in which the game can continue to be played.

It can do this in three key ways. First by cutting, not increasing, its own pollution. Second, by not promoting heavily polluting products and lifestyles that worsen the problem. Third, by being a positive voice for climate action. By telling everyone about what it is doing, and encouraging other fans and corporations to change as well. Football is uniquely and simultaneously connected to a huge public, giant corporations, political leaders and influential role models.

Its unparalleled reach, inspires billions of people around the world, and transcends the barriers of language, culture and geography. Football players are among the most popular people on this planet, trusted more than politicians and religious leaders. Football brings people closer together – it unites us.

An increasing number of players and clubs are acknowledging the climate opportunity at their feet. Clubs are switching to renewable energy sources, offering more plant-based food options and encouraging their fans to choose sustainable travel options. Players increasingly are speaking out on their concern over the climate crisis and demanding action.

Now decisions are needed from the top of football. They set the policy on which advertising is allowed, together with national football associations and government, and organise the football calendar. So, what about FIFA, confederations and national associations? The commitments are there: FIFA, UEFA and some big national football associations have signed up to UN goals to reduce their emissions by 50% by 2030 and reach net-zero by 2040.

Unfortunately, looking at the reality, we see things going in the wrong direction.

First, sponsorship. In April 2024, FIFA signed a deal with the world's biggest oil company, Saudi state oil company Aramco. Female players led the protest against that deal and showed that, like most people in the world, players and fans don't want to see FIFA advertising big polluters. UEFA has a long-running sponsor deal with Qatar Airways and airline sponsors are everywhere in the top of European football.

Secondly, the football calendar. This men's season saw an expanded UEFA Champions League and will end with the first 32-team Men's Club World Cup. This report shows what is obvious to everyone already: a growing international calendar leads to more pollution, requiring more stadium construction and air travel. The facts are shocking: the emissions of one Men's World Cup match are equivalent to between 31,500 and 51,500 average UK cars driven for a whole year. With every game added to the football calendar, international football associations make the world less safe for the football community. We see that the expanding football calendar not only leads to more pollution, but also to overburdened players who then run a higher risk of injury, and who tell us that it lowers the quality of the game. It's time to reverse this trend.

So, what to do? It's clear that football should break ties to polluters. Just like with tobacco, our sport should no longer be used as a platform to sell products that threaten our health and safety.

When it comes to the playing schedule, it's time to go back to the drawing board and develop a calendar fit for the time we live in. We suggest FIFA, UEFA and other football bodies sit around the table with players, fans and climate experts to develop a new football calendar. It will be smaller and more regional and thereby protect players, the quality of play and the planet.

This report shows how dire the situation is, but also clearly signals how to turn things around quickly. It's up to international and national football associations to lead on this.

The moment to act is now. Current and future generations of players and fans will be grateful.

Tessel Middag
Professional football player,
Rangers FC and capped 44 times for the Dutch national team

David Wheeler
Professional football player,
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Executive summary

Global climate change is one of the greatest threats currently facing human society and natural ecosystems. Football, through its huge cultural reach, can help galvanise action to tackle this problem. It can do this by taking timely action to reduce its own greenhouse gas (GHG) emissions, acting as an inspiring example of what can be achieved. But data on the global scale of its own emissions is patchy, while there are indications that its emissions may actually be increasing.

This report digs into the evidence. It shows that, while there are positive words from some senior officials and a growing number of initiatives to measure and reduce GHG emissions, they are deeply undermined by several negative trends, the three most critical being: sponsorship deals with high carbon pollution sectors, including fossil fuel corporations and airlines; an expansion in the number of international matches, which is contributing to increases in air travel; and the widespread use of controversial carbon offsets. In general, there is a lack of urgency in climate-related efforts – with even schemes to measure emissions still at an early stage or non-existent.

On current projections, the Paris target to keep global temperature rise below 1.5°C will be breached by 2031. Yet our research indicates that the football sector is not even close to doing its fair share to prevent this. Action needs to be rapidly increased. The good news, however, is that there is a range of feasible actions which could bring very large reductions. Chief among them would be to end high carbon sponsorship deals.

In more detail, the main findings of this report are as follows:

- We estimate the total carbon footprint for the global football sector is 64-66 million tCO_2e (tonnes of carbon dioxide equivalent) per year, equivalent to the annual GHG emissions of a nation such as Austria. Over 75% of this is due to sponsorship deals with high carbon companies.[1] These deals stimulate carbon intensive consumer demand by promoting heavily polluting products and lifestyles (the extra emissions from which we term 'sponsored emissions') much in the same way as tobacco sponsorship of sport in the past encouraged smoking. To our knowledge, this is the first time an estimate has been made for the size of the total emissions due to this sector.
- Sponsorship deals between elite football and the oil and gas industry and airlines are especially large in financial terms. The biggest deals currently in operation include FIFA and CONCACAF partnerships with Aramco, the world's largest oil and gas corporation, and leading European club partnerships with airlines, such as Emirates, Etihad Airways, and Qatar Airways. It is no coincidence that these sponsors are mainly based in the oil-rich regions of the world. Specifically, we estimate that:
  - four major sponsorship deals of the men's World Cup Finals in 2022 were together responsible for GHG emissions of more than 16 million tCO_2e;
  - the four largest sponsorship deals between European clubs and airlines in 2023 were together responsible for GHG emissions of more than 8 million tCO_2e. The four clubs involved were Paris St Germain, Real Madrid, Manchester City, and Arsenal.
- We estimate that the global carbon footprint of football's non-sponsorship activities to be 13-15 million tCO_2e per year, equivalent to the GHG emissions of a nation such as Costa Rica.
  - The activities which contribute most to this total are spectator travel to matches and the construction of new stadiums. Air transport and car transport are particularly problematic. We have found clear evidence that the expansion of international football tournaments, and the increase in air travel that they cause, are increasing emissions.

  - Other main activities included in this total are the production and sale of merchandise, energy use and catering at stadiums, and team and employee travel.
  - Over 93% of these emissions are due to the activities of elite domestic leagues – with annual attendances above one million – and international tournaments.
- We estimate that the GHG emissions per match in a men's elite domestic club competition – such as the English Premier League – are about 1,700tCO_2e, with travel-related emissions being about half of this total. The total rises by about 50% for a match in an international club competition, mainly due to air travel by spectators. One match at a men's World Cup Finals is responsible for between 44,000tCO_2e and 72,000tCO_2e – between 26 times and 42 times that for a domestic elite game. The emissions of the World Cup match is equivalent to between 31,500 and 51,500 average UK cars driven for a whole year. These figures do not include high carbon sponsorship-related emissions – which we estimate, on average, increases total emissions per match by over 350%.
- We estimate that the men's World Cup – including finals and qualification – has in recent years been responsible for 6.5 million tCO_2e over its four-year cycle – with most emissions concentrated during the finals. We further estimate that other international men's competitions and matches – including the EUROs, Copa America and others – are collectively responsible for an average of 1.5 million tCO_2e per year. The expansion of the World Cup Finals from 32 to 48 teams – from 2026 onwards – will likely lead to a major increase in GHG emissions.
- GHG emissions from women's football represent a very small fraction of those of the men's game, but are likely to be rising quickly with the current expansion of the sport.

- Data on football-related GHG emissions is in general of low quality and sometimes even non-existent, even at elite levels. Data collection is at an early stage of development in most cases. For example:
  - In club level data from the English Premier League and the German Bundesliga, we found that all the highest estimates in the main emissions categories were at least 10 times the lowest estimates. Hence, we had to make many simplifying assumptions and extrapolations to produce our average estimates, and we were intentionally conservative in doing so. This poor quality of data is particularly disturbing as the English and German leagues are seen as world leaders on climate action in football.
  - At international level, we could find no official estimates of the emissions of World Cup qualification phases, or for the finals or qualification stages of the regional tournaments run by five of the world's six football confederations – in Africa, Asia, North America, South America, and Oceania. Hence, we were only able to produce first estimates with high uncertainties for these competitions.
  - Further effort to improve data quality is urgently needed and football's governing bodies should make this a priority going forward.
- Efforts to address the GHG emissions of football are still in their early stages, despite the importance of the climate crisis.
  - There is very little acknowledgement by clubs or football associations of the damage caused by sponsorship deals with high carbon pollution companies.
  - Attempts to measure the carbon footprints of elite clubs, football tournaments, and governing bodies often do little more than focus on 'scope 1' and 'scope 2' emissions – a small fraction of the total.
  - Even when more comprehensive GHG assessments are carried out – for example, at the men's World Cup Finals – there are still significant shortcomings.
  - The potential emissions associated with high carbon sponsorship deals are ignored.
  - Action is being undermined by the expansion of elite international tournaments, such as the men's World Cup Finals and the men's Champions League in Europe.
  - Efforts to reduce emissions, where they do exist, are often limited or sidelined by a focus on carbon offsets, an approach strongly criticised by both climate scientists and regulators.
- However, there are some glimmers of hope.
  - Leading women footballers have called for an end to Aramco's sponsorship deal with FIFA, and Bayern Munich dropped Qatar Airways as a shirt sponsor following fan protests over human rights concerns, showing what is possible.
  - Initiatives such as Pledgeball and Planet League are having some success encouraging football fans to adopt low carbon behaviours through club-based competitions, while other groups like the Cool Down Network and multiple football-focused climate campaigners are making the issue a permanent feature of commentary on the game.
  - The UN Sports for Climate Action Framework (S4CA) is just starting to encourage emissions reduction action among some elite clubs and football associations.
  - Some measures to improve surface public transport and increase its usage by fans have become a significant element in the staging of some international football tournaments – especially at World Cups and the EUROs.
  - A few clubs like England's Forest Green Rovers are pioneering low-carbon action.

Our main recommendations are:

- Estimates of the GHG emissions of football clubs, associations, and tournaments should include an assessment of the additional 'sponsored emissions' resulting from sponsorship deals using methodologies like the one applied in the report. Elite clubs and top governing bodies should take the lead in this activity.
- There should be a rapid phase-out of all football sponsorship deals with high carbon, heavily polluting corporations. Ending deals with fossil fuel companies, airlines and SUV makers should be a particular priority. FIFA, the six continental confederations, and elite clubs must take a leadership role. A rapid phase-out plan should be a condition for team entry to elite competitions. New deals with low carbon companies should rapidly become the norm.
- Further expansion of international football tournaments in the men's and women's game should be halted and reversed. This will reduce GHG emissions from air travel and new stadium construction, as well as benefit player welfare. Smaller, more regional tournaments should be the norm. These can be complemented by initiatives to encourage sustainable transport.
- Ticket sales for international tournaments should focus on local fans. This would make it more exciting for people to see an international tournament coming to town, as well as markedly reducing emissions.
- The S4CA should be strengthened, with added science-based targets and timeframes for action, drawing on expertise from schemes such as the Science-Based Targets initiative (SBTi). In particular, the widespread and poorly regulated use of carbon offsets – as currently practiced by many football organisations, and allowed for by the S4CA – should be immediately ended.
- All football governing bodies and elite clubs should sign up to the S4CA, and this should be made a condition for entry into elite competitions. Pending the improvements discussed above, S4CA signatories should not use carbon offsets for meeting their 2030 emissions targets.
- Action in and around the stadium should be taken, including the increased use of solar photovoltaic panels, LED floodlights, electric heat pumps, electric vehicles, and plant-based food, together with a reduction in the amount of new football shirts and other merchandise. However, as this report makes clear, the most important areas for climate action in football are high carbon sponsors and the sporting calendar.
- The scheduling of games should be aligned to enable maximum, easy use of public transport by fans, and financial incentives on ticket price to encourage travelling by low carbon, mass-transit.
- While carbon offsets should not be counted towards GHG emission targets as discussed above, football bodies should still fund climate-related projects in their community or region. Clubs should also vigorously promote fan participation in initiatives such as Pledgeball and Planet League, which could contribute to much-needed environmental behaviour change in wider society.
- Players should have freedom of speech to talk publicly about their environmental concerns and take a leadership role, to use their platforms to speak out on climate threats and be able to criticise polluting sponsors without fear of censure.

In summary, as the climate crisis rapidly worsens, it is time for the football sector to step up and take responsibility, both for its contribution to the problem, and for the opportunity to galvanise global action to help lessen the impacts.

1. Introduction

> "Climate change and its impact is undoubtedly one of the most pressing challenges of our time, if not the most critical, and it requires each of us to take immediate and sustainable climate action."

Gianni Infantino, FIFA President[2]

> "Our commitment to protecting our climate remains unwavering. We recognise the critical need for everyone to help implement the Paris Agreement."

Fatma Samoura, FIFA Secretary General[3]

> "Our vision is for FIFA to reach net zero by 2040, and for football to be a unifying tool to drive global climate awareness and action."

FIFA Climate Vision[4]

> "(FIFA's) willingness to let Saudi Arabia improve its reputation through football is isolating players, fans and the planet. Securing a future for football, where everyone can play it and enjoy it, requires real leadership from the very top. The 2034 World Cup decision is further proof that football deserves better."

Tessel Middag, professional player with 44 caps for the Dutch national team

The scientific evidence on the catastrophic threat from climate change due to human emissions of greenhouse gases (GHG) is overwhelming – and this is widely accepted by politicians, industrialists, and the public across the world. Leading figures in the world of football also accept this, as the quotes above – from the sport's global governing body, FIFA – demonstrate. As part of this, they accept that the football sector should take action to measure, report, and reduce the GHG emissions that it is responsible for – in order to play its part in meeting the main aim of the United Nations Climate Convention "to prevent dangerous [human] interference with the climate system" (see Box 1.1). Yet, a systematic study of the GHG emissions of the global football sector, and how to reduce these emissions in ways compatible with international treaties, has yet to be carried out – until now.

The aim of this study is to fill this gap. We draw together the available data – from domestic clubs, international competitions, academic studies, and a range of other sources – to provide a first estimate of the global carbon footprint of football. We identify the key sources of these emissions – from the energy consumption at stadiums, to the travel behaviour of fans and teams, to the impacts of club merchandise. Crucially, we also investigate the contribution to emissions from high carbon pollution sponsorship of the sport by sectors such as the fossil fuel industry and airlines – an area which, so far, has been largely ignored in GHG accounting of sport. We highlight reporting gaps – where data is poor or non-existent – and suggest areas for improvement. We review the action taken so far to reduce emissions, and identify key priorities for both football governing bodies and clubs. We explore where 'green' technologies can help, but also where organisational change or behaviour change needs to be the priority. We also highlight areas of particular controversy such as 'carbon offsets'.

The focus of this report is mainly on the men's game – due to its overwhelming size and scale. However, we do devote a section to the rapid growing women's game – and especially the role it could play in helping to move the whole sector away from high pollution activities.

While the football sector may not be one of the largest sources of international GHG emissions, because of the sport's enormous cultural reach - the 2022 World Cup claimed over five billion 'engagements'[5] – it can help shape global public opinion on the urgency of the climate threat and on the types of action necessary to tackle that threat. If football is slow to take action, or is seen to collude with high carbon sectors in resisting action, it can undermine vital efforts to tackle the climate crisis. Improved understanding of the sport's role in these areas is a fundamental motivation for undertaking this study.

The structure of the report is as follows. In section 2, we begin by examining the available data on the GHG emissions of domestic football across the world. We focus on a sample of elite clubs in Europe and, together with related studies, use this as a basis for making global estimates of emissions. We then review some of the efforts to reduce these emissions, highlighting the most effective. In section 3, our attention turns to the international game, assessing emissions of tournaments involving national teams and clubs. Of particular note here is the World Cup – not only because of its prominence, but also because more data on its GHG emissions has been collected than for most other competitions. The role of air travel and new stadium construction are particular focuses of this section. In section 4, we explore the neglected issue of football sponsorship by high carbon pollution corporations, and how this could be a major source – if not, *the* major source – of GHG emissions within the sport. In section 5, we review the up-and-coming role of the women's game – both as a source of GHG emissions, but also as a catalyst for helping to shift the whole sector onto an environmentally sustainable path. In section 6, we draw all the key data together and provide an estimate for the global carbon footprint of the whole football sector. Finally, in section 7, we provide a range of conclusions and recommendations on the issues raised.

Box 1.1 An introduction to climate science and terminology

Global climate change is being caused by emissions of greenhouse gases (GHGs) from human activities. The main GHGs are carbon dioxide, methane, and nitrous oxide. The main human actions which release them are the burning of fossil fuels – coal, oil, and gas – as well as deforestation and a range of other agricultural and industrial activities. GHG emissions are also known as 'carbon emissions' or 'carbon pollution', and are measured in 'tonnes of carbon dioxide equivalent' or tCO_2e – which is the unit we use in this report. The scientific evidence that climate change is happening and is mainly caused by human activities is overwhelming, and is summarised in regular reports by the Intergovernmental Panel on Climate Change (IPCC), the UN's top scientific advisory body in this area.

In 1992, nations agreed a treaty called the United Nations Framework Convention on Climate Change (UN FCCC) to "prevent dangerous [human] interference with the climate system".[i] The treaty has led a number of further international climate agreements, including the Kyoto Protocol in 1997 and the Paris Agreement in 2015, both of which included specific targets for reducing GHG emissions. The Paris Agreement has an aspirational target to reduce global GHG emissions to levels which would restrict the rise in globally-averaged temperature to less than 1.5°C above pre-industrial levels. Beyond this, major global and regional impacts become highly likely, with some being irreversible. However, action by the most polluting nations, sectors, and groups in society has to date fallen far short. At the time of writing, the latest projections from leading climate scientists indicate that the temperature target is likely to be breached as soon as 2031.[ii] Because there is a time lag between human emissions of GHGs and the corresponding response of the climate system, this means that at the current annual emissions rate, the world will pass the threshold beyond which a 1.5°C rise is likely by 2027.[iii] This is known as 'exceeding the global carbon budget'. Hence, it is very urgent that climate action is rapidly increased. However, it should also be noted that, even if the 1.5°C target is breached, it would still continue to be essential to reduce emissions rapidly, as the greater the breach, the greater the damage to human society and natural ecosystems.

The total GHG emissions of a particular organisation (or sector) is often called its 'carbon footprint'. These emissions are generally classified in one of three 'scopes':[iv]

- **Scope 1:** direct emissions – e.g. those from fossil fuels burned by an organisation's assets, such as 'natural' gas in the central heating of its buildings, or petrol in its cars;
- **Scope 2:** indirect energy-related emissions – e.g. those due to the generation of electricity used in an organisation's buildings;
- **Scope 3:** other indirect emissions – e.g. those during the manufacture of products bought by the organisation, or during travel by participants at an event hosted by the organisation.

Reporting guidelines also state that emissions data should be relevant, complete, consistent, transparent, and accurate.

A carbon footprint can also be estimated by mathematical modelling of the environmental-economic system – which we discuss in section 6.

References
i. United Nations (1992). Framework Convention on Climate Change. Article 2. https://unfccc.int/resource/docs/convkp/conveng.pdf
ii. IGCC (2024). Indicators of Global Climate Change. 18 October. https://climatechangetracker.org/igcc
iii. As note ii.
iv. WBCSD/ WRI (2015). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised edition). https://ghgprotocol.org/corporate-standard

Box 1.2 A note about sources

In this study, we have used data from primary and secondary sources. Primary sources include: sustainability reports, annual reports, financial reports, websites, and other similar material published by football governing bodies, clubs, and other organisations; academic papers; and research reports by think-tanks and consultancies. Secondary sources often provide football-related data in a more accessible online form on tournaments etc, so we have used those as well. Such sources include Football Web Pages, FootyStats, Statista, Wikipedia, and reputable media outlets. We have cross-checked a sample of this data to ensure its consistency with primary sources, and any discrepancies were found to be infrequent and minor.

2. Greenhouse gas (GHG) emissions of men's domestic football

In order to start to estimate the carbon footprint of the football sector, we will first focus on the men's domestic game. Domestic football is the backbone of the sector – from small community-based clubs up to those that play in elite leagues and bring in revenues in the hundreds of millions. They generally compete in tournaments on a national or regional basis, organised by a national body.

In this section, we start with a summary of the key elements of domestic club competitions that are most relevant to this study. Then we bring together the available data on GHG emissions at the club level to estimate the carbon footprint of a 'typical' elite men's club. We then use this as the basis of an estimate for the carbon footprint of the world's clubs. We conclude this section with an overview of the current efforts by clubs to reduce their GHG emissions. Note that the GHG emissions of international club competitions are covered separately, as part of section 3.

2.1 Domestic football: the basics

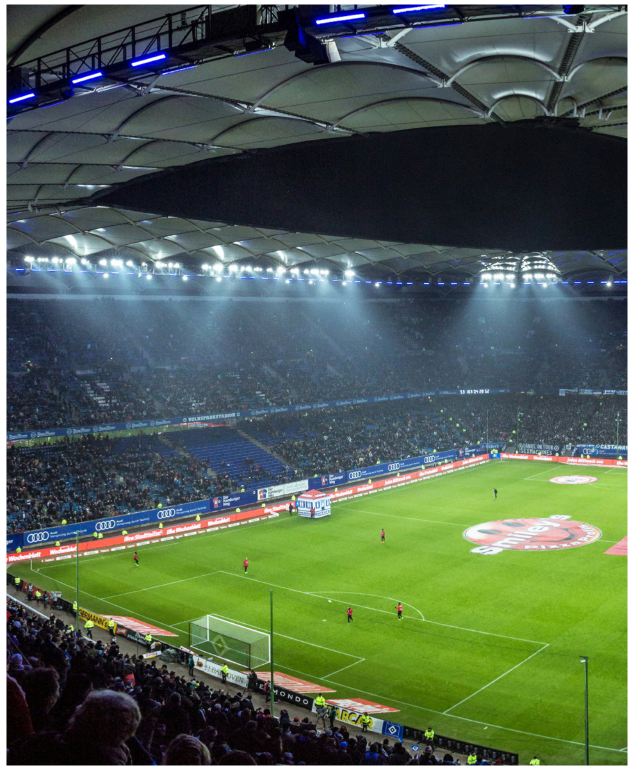
In summarising the basic elements of domestic football, we will focus on those aspects most likely to affect GHG emissions, such as: the number of matches in a season; the number of spectators attending those matches; how often, how far, and by what mode of transport spectators and club officials travel; and the energy and materials required to maintain the assets of a football club, not least its stadium. One further factor is the monetary income of clubs which, as we will see in section 4, can have a major and largely unrecognised indirect effect on GHG emissions. Many of these basic elements will be very familiar to followers of football, but the significance of the details for the climate issue are often less well understood.

2.1.1 Football competition formats: how these affects the number of matches played

As all football fans will be aware, clubs play in two types of tournaments during a season: 'league' and 'cup' competitions.

Leagues are where all teams play each other twice – a 'home' match at their own stadium, with an 'away' match hosted by the opposing team. Hence, the number of matches played by each team in the league is the same, and the total number can be calculated using the first equation in Box 2.1.

Mathematically, the number of league matches in a season thus rises with the 'square' of the number of teams. This means that the number of matches can become much higher with the addition of only a few extra teams to that league. For example, the German Bundesliga includes 18 teams and thus plays 306 matches a season, whereas the English Premier League only includes two teams more – 20 – but plays 380 games a season – 74 games more. So, for an 11% rise in the number of teams, there is a 24% increase in the number of matches – and thus match-related GHG emissions. We'll return to this issue in later sections.



> the number of matches can become **much higher** with the addition of **only a few extra teams** to a league

Box 2.1 Calculating the total number of matches in a football season

Calculating the number of matches in a competition – whether 'league' or 'cup' – is an important component in estimating the total GHG emissions of that competition.

In standard league competitions, where all teams play each other twice (one home and one away fixture), the total number of matches is calculated using the following equation:

$M_t = N \times (N-1)$

M_t – *total number of matches*

N – number of teams in league competition

An explanation of the derivation of this equation is given in appendix 1.

The number of matches for a basic cup or 'knock-out' competition – where each fixture is played until there is a winner (possibly including a penalty shoot-out), i.e. there are no replays, and where only the winners progress to the next round of games until a single team triumphs – is calculated using the following equation:

$M_t = N-1$

M_t – *total number of matches*

N – number of teams in cup competition

Hence, for a given number of clubs, *N*, a standard league competition will involve *N* times more games than a standard cup competition.

Cup competitions generally follow a 'knock-out' format, where each team only progresses to the next round if it wins. The total number of matches is usually set at the start of the competition, but the number played by each team depends on it winning each game, and so can vary from one up to the total number of knock-out rounds played for the winner. The total number of matches for a standard knock-out competition can be calculated using the second equation in Box 2.1.

Thus – for a given number of clubs – a standard league competition will always involve many more games than a standard cup competition. Again, this is significant for GHG emissions, and it is something we will return in later sections.

In practice, however, additional rules can mean that the total number of matches in a competition will vary. For example, if replays are allowed in cup competitions in cases where a match is drawn, then this can increase the number in an unpredictable fashion. Another example is when league and cup formats are combined, such as in the World Cup Finals or some European club competitions (see section 3).

Another significant issue is that league competitions (and some cups) are set up in a strict hierarchy, with the highest performing teams playing in tier 1, the next in tier 2, and so on. A group of clubs which finish the season at the bottom of a league are relegated to the tier below, with those finishing at top of the succeeding league being promoted. With monetary rewards depending as well on league and cup positions, the on-pitch performance of a club is intimately tied to its financial position. Again, this will have an important effect on GHG emissions.

Finally, league positions can affect where and how teams enter cup competitions. For example, clubs in the English Premier League do not need to take part in the first and second rounds of the FA Cup (the nation's most prestigious cup tournament) – they are given direct entry to the third round, meaning they would play a maximum of six games in this competition to win it. At the other end of the scale, the teams in the lowest tiers of English football take part in a series of qualifying rounds to see if they reach the first round, so they can potentially play more games in this competition than the winners. International club competitions – see section 3.2 – complicate this picture even further and, because of the greater travel distances involved, have the potential to increase club GHG emissions markedly.

2.1.2 Which domestic competitions attract the most spectators?

The domestic competitions which attract the largest stadium crowds tend to be tier 1 league competitions in nations with a strong football following. The final rounds of cup competitions in those countries can also attract large numbers of spectators.

The ten domestic competitions across the world with the highest audiences per season are:[6]

1. **English Premier League (EPL)**[7]
2. **Germany's Bundesliga**
3. **Spain's La Liga**
4. **Italy's Serie A**
5. **USA/ Canada's Major League Soccer**
6. **English Football League Championship**[8]
7. **France's Ligue 1**[9]
8. **Brazil's Brasileirão**
9. **Mexico's Liga MX**
10. **Germany's 2 Bundesliga**

Others with large followings are based in Japan, Argentina, the Netherlands, and China. The EPL typically attracts a total attendance of about 15 million per season, while even the Chinese Super League has more than five million spectators. It is also striking that England and Germany both have their tier 2 leagues in the global top ten as well – demonstrating the strength of the following in these nations.

Clubs with the largest stadiums within these top leagues will obviously attract the most spectators – again strongly affecting GHG emissions. For example, in the EPL at the time of writing, the largest stadium has a crowd capacity of over 74,000 – Manchester United's Old Trafford – while the smallest has a capacity of just over 11,000 – Bournemouth's Dean Court. Average attendances over a season tend to be close to these maximums.[10]

Stadium crowd size is also obviously key to club finances, with 'matchday' income – spending by spectators on tickets, merchandise, catering etc when they attend a game – making up a high proportion of total revenues. However, in recent years, income from TV broadcast of matches and sponsorship have become large shares of club income. Thus, GHG emissions arising from these factors also need to be considered. We will look at the issue of sponsorship, in particular, in section 4. However, for now, it is simply worth noting the huge difference in income even between leading clubs. The financial consultancy, Deloitte, annually compiles the 'Football Money League', which lists the income of the 20 highest earning clubs in the world. In 2024, the top club, Real Madrid, had a total income of €831m, while for the 20th club, Olympique de Marseille, this figure was only €258m – less than one-third of the size.[11] Matchday income was only 18% of the total revenue of these 20 clubs.

2.1.3 How do fans get to matches?

As we shall see, travel is a major element in the carbon footprint of football. This is strongly affected by the distances between the clubs taking part in a tournament – which, in turn, is affected by the size of the country within which the tournament takes place. Countries that split their football into regions – for example, the UK runs separate English, Scottish, Welsh, and Northern Irish competitions – can significantly reduce the travel distances involved in those competitions. Another important factor is the proportion of spectators that are away fans, and hence travel these long distances. Small numbers mean a smaller carbon footprint. A further critical factor is the availability of surface public transport – are there fast and reliable bus, train, or tram links that connect with a football stadium? Also, does a club favour car drivers by providing lots of parking or provide incentives to use lower-carbon public transport? Finally, do some players, fans, and officials fly to matches? Given the energy intensity of air travel, this can be the largest factor of all.

2.2 What are the GHG emissions of a typical elite club?

Given the prominence of English and German leagues among those with the world's highest number of spectators, these are a useful focus for our efforts to estimate carbon footprints at football club level. Indeed, the EPL and the Bundesliga are considered to be international climate leaders within the sector – but, sadly, this does not necessarily translate into the required action. For example, in the 2021-22 season, only 15 of the 20 EPL clubs unambiguously reported their scope 1 and 2 emissions,[12] which is the minimum recommended by the international standards body, the GHG Protocol. Only four reported any scope 3 emissions[13] – which, in general, form the bulk of an organisation's emissions – and even this data varied considerably in quality. Data on the 2022-23 season was little better. More figures are now starting to be published, especially given the EPL's new requirement that all their clubs publish data on scopes 1-3 by 2025-26 season.[14] Nevertheless, GHG emissions reporting by football clubs – even in leading nations – is still not yet well-developed.

We have summarised the key data identified in this study in Table 2.1. The data is broken down into four main categories which seem to best illustrate the main sources of reported emissions:

- scopes 1 and 2 (direct emissions and indirect emissions from energy use, e.g. electricity);
- spectator travel;
- stadium renovation/construction; and
- other scope 3.

The data is derived from three main sources: club sustainability reports (including four from the EPL and two from the Bundesliga); academic studies (one study by a German institute and one Italian); and environmental/ consultancy organisations (four UK-based groups, which have sourced their data from club reports).[15] From this, we have attempted to estimate the annual GHG emissions of an 'average tier 1 club' for a typical season.

Graph 2.1 Annual GHG emissions of typical men's tier 1 league football club

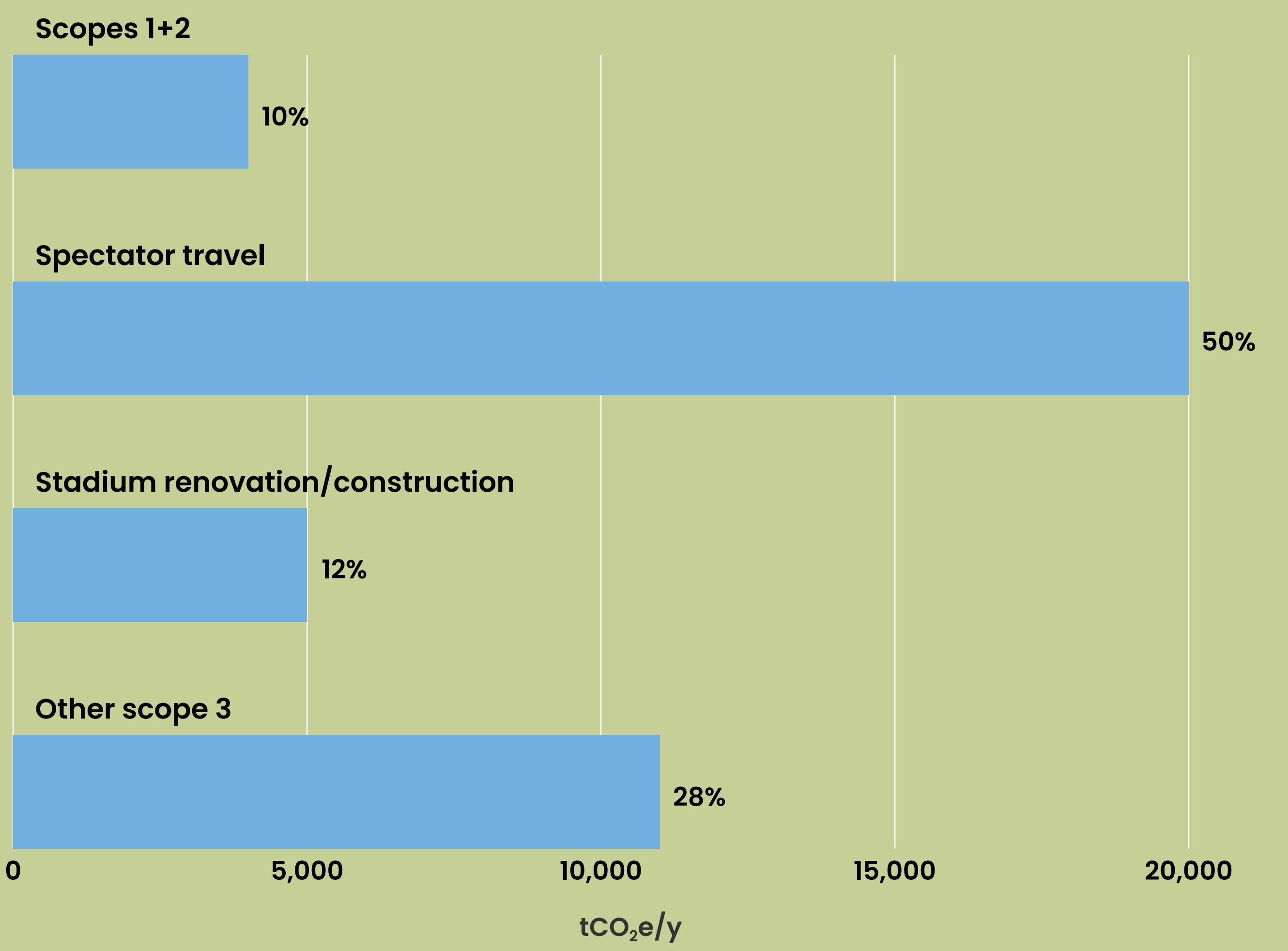


Table 2.1 Source data and estimates of the annual GHG emissions of a typical tier 1 league club by category (tonnes of carbon dioxide equivalent, tCO_2e)

Main data source	Scopes 1 and 2	Spectator travel	Stadium renovation / construction	Other scope 3	Total	References
English Premier League: average, 2021-22	2,900					2023 club sustainability reports (FCCN, 2023a)
German Bundesliga: average, 2018-19		20,500				Loewen and Wicker (2021)
Liverpool FC: 2021-22	300	15,500		139,800	155,500	2023 club sustainability report
Manchester City FC: 2021-22	4,900	7,600		11,700	23,200*	2022 club sustainability report
Tottenham Hotspur FC: 2022-23	7,200	44,600		42,100	93,900	2023 club sustainability report
Wolverhampton Wanderers FC: 2021-22	1,700	11,100		300	13,000	2022 club annual report
VfL Wolfsburg FC: 2017-18	4,500	6,000		2,600	13,100	2020 club sustainability report
VfL Wolfsburg FC: 2021-22	3,700	3,600		3,000	10,300	2022 club sustainability report
Anonymous tier 1 club: 2018-19	1,700	8,100		1,700	11,400	Khana et al (2024)
FIFA World Cup 2022			5,000			CMW (2022)
Tier 1 club: estimate, 2018-19					9,300	RTA (2020)
English Premier League: estimate, 2018-19					35,000	Planet League (2022)
This study: estimate for tier 1 club	**4,000**	**20,000**	**5,000**	**11,000**	**40,000**	

Notes and references
All figures rounded to nearest one hundred tonnes. This means some totals are not precisely the sum of their constituents.
Scopes 1 and 2 – includes gas and electricity use at club-owned facilities; fuel use in club-owned vehicles.
Spectator travel – includes transport emissions (and overnight accommodation where data is available) of spectators travelling to and from matches.
Stadium renovation and construction – includes an amount based on recent information on major stadium-related works averaged across all clubs in the league division.
Other scope 3 – includes team travel, travel by other club employees, employee commuting, catering, merchandise, and other documented emissions.
For a full list of references, see main text.
* The stated total for Manchester City does not include emissions subtracted due to new forest growth on the club's land.

The first thing to notice is the wide variability of figures even for these four standardised categories – with the highest always more than *10 times* greater than the lowest.

Scope 1 and 2 emissions are, in theory, the easiest to measure. These include gas and electricity use at club-owned facilities – mainly stadiums – and fuel use in club-owned vehicles. These figures should mainly vary due to the size of the stadiums and the number of vehicles and their travel distances. However, reporting can be complicated by various factors. For example, organisations may not keep adequate records of the buildings and vehicles which should be included in the assessment. When VfL Wolfsburg FC revisited their data collection procedures in 2022, after ten years of reporting emissions data, they revised up the total for scope 1 and 2 emissions by a surprisingly high factor of 120%.[16] Another complicating factor is that some clubs have started to purchase their electricity and/or gas through renewable energy tariff schemes. However, their reporting of the related GHG emissions can also vary. Some clubs consequently report zero emissions in this sub-category while others still report the emissions, but state they have been mitigated. For example, Liverpool FC only reported 300tCO_2e for the 2021-22[17] season while Tottenham Hotspur FC (more commonly known as Spurs) reported 7,200tCO_2e[18] – yet both reported buying energy through green schemes, and the average attendance per match (which strongly influences stadium energy use) was also similar. We based our estimate in this category of 4,000tCO_2e most strongly on the average of reported emissions per Premier League club in 2021-22 – about 2,900tCO_2e – with the assumption of some low reporting due to green tariffs (which are not yet widely used). We further note that after implementing its new data collection procedures, Wolfsburg recorded 3,700tCO_2e in the 2021-22 season,[19] even though it reported zero emissions from electricity due to use of a green tariff. (We will return to the issue of green tariffs later.)

The data in Table 2.1 points to spectator travel being responsible for the largest share of club emissions. However, the data we have collected also varies more than might be expected in this category. Estimates are generally compiled by using surveys of spectators, asking about their transport mode, travel distance, and sometimes overnight accommodation. However, there can be significant variations in methodology. For example, Wolfsburg surveys their own fans about travel habits at both home and away matches. Manchester City, on the other hand, estimates travel emissions of all fans attending their home games only. The latter seems to be more commonly used by clubs carrying out this sort of assessment. An academic study surveyed the travel behaviour of spectators of the 18 teams of the Bundesliga during the 2018-19 season,[20] and estimated average emissions per club of approximately 20,500tCO_2e for this category. This league has slightly higher average attendances per match to the EPL, but the latter plays more matches per season – 380 compared to 306 (see section 2.1.1) – so it would be expected that emissions per club would be around the same level. However, the data from the four EPL clubs – three of them in the top six by attendance[21] – indicates a more complex picture. Manchester City's estimate – 7,600tCO_2e[22] – is especially low, while Spurs' – 44,600tCO_2e[23] – is especially high. The average attendances for these clubs are similar, so that is not the reason for the differences between them. The Manchester City data includes cup matches as well as league games, including against European opponents – so their emissions would be expected to be at the high end of the range. Data on the mode of travel also does not provide an explanation for City's low figures: 65% of Manchester City fans reported travelling by car – a high carbon option – against only 41% for Spurs fans. However, their sustainability report does say that this is "Manchester City fan information, and not away team visiting fans"[24] – which implies that they are under-reporting the emissions of *all* spectators to their matches. The role of spectator travel by air – especially visiting fans at international matches – is a factor that would strongly affect these figures – see Box 2.2. For our estimate we simply opted for 20,000tCO_2e per club per season – which is similar to the Bundesliga average and the average for the four EPL clubs. However, we will return to the issue of air travel in the next section.

Box 2.2 The role of air travel in club match emissions

Air travel is an especially polluting form of transport. UK government statistics[i] show that the average passenger flying within the UK emits about *seven times* as many GHG emissions per kilometre as the average train passenger.[i] For certain international journeys within Europe – such as London to Paris – this factor can rise to *over 30*, due to the use of low carbon electricity for the Eurostar train rather than diesel.[i]

In European club competitions, the organising body UEFA (see section 3) specifies that at least 5% of match tickets should be allocated for away fans.[ii] So, if a match has an attendance of 50,000 – typical for clubs at this level – then at least 2,500 will be away fans who would have very likely flown. For a typical travel distance of 1,200km – e.g. Manchester to Munich, or London to Madrid – this would translate into about 900tCO_2e per match – which is over half of our average (see main text) of about 1,700tCO_2e for *all fans* attending an EPL game.

So, clearly, club matches played in a large nation – e.g. the USA or Brazil – or in international competition (see section 3.2) are likely to have a much greater carbon footprint than domestic matches in a smaller country.

One other factor – which especially applies to some of the top European clubs – is that they have a significant international following. So some 'home' fans will fly from abroad to attend matches. An example of the scale of this travel is given by a recent survey by the tourist organisation VisitBritain.[iii] It concluded that 1.5 million inbound visitors to the country went to a live football match in 2019. While not all will have made a dedicated flight for the sole purpose of attending a match, it is clear that elite football is a wider driver of air travel.

References

i. Data from: BEIS (2022). Greenhouse gas reporting: conversion factors 2022. September. https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022
Note all these figures include the additional climate heating effects due to planes travelling in the stratosphere. See Box 4.2 for further discussion of this issue.
ii. UEFA (2023). Regulations of the UEFA Champions League: Article 38 Ticketing. https://documents.uefa.com/r/Regulations-of-the-UEFA-Champions-League-2023/24/Article-38-Ticketing-Online
iii. VisitBritain Research (2021). Football Tourism in the UK. https://www.visitbritain.org/research-insights/football

From data on World Cup Finals, stadium construction and refurbishment seems to be a major source of emissions (see section 3.1.1), but we found virtually no data at a club level. Nevertheless, it could be significant. The carbon footprint of a World Cup standard stadium – minimum capacity of 40,000 spectators, which is similar to the average attendance for EPL and Bundesliga matches – was estimated to be 270,000tCO_2e for the 2022 competition in Qatar.[25] If a new club stadium was built every three years and its GHG emissions averaged across all the teams in the league over that period, this would work out as 4,500tCO_2e for a club in the EPL. Three Premier League clubs have moved into new stadiums in the last eight years – West Ham in 2016; Spurs, 2019; and Brentford, 2020 – a slightly higher rate than once every three years (and future moves by other clubs such as Everton are close or planned). Hence, we have rounded this figure up to 5,000tCO_2e. We also note that major renovation of stadiums tends to happen more frequently than the building of new ones, so this category includes that element as well, and hence our figure could be considered to be on the conservative side.

Under 'other scope 3' we have included reported figures for emissions of sub-categories that are not covered elsewhere in our table. There seem to be six main areas: team travel (including accommodation, but not using club-owned vehicles); travel by other club employees (again, not using club vehicles); employee commuting; catering; merchandise; and other documented emissions. Data in these sub-categories again varies considerably, and sometimes these areas are merged or not included at all. For example, under team travel, Wolverhampton Wanderers reported only 68tCO_2e[26] while Manchester City reported approximately 2,100tCO_2e.[27] Tottenham Hotspurs and Wolfsburg reported this under a broader travel category, while Liverpool only reported team flights separately. A 2019 academic study[28] reported an average for EPL clubs of 1,100tCO_2e per season – but this only included league matches, not any cup competitions (domestic or international). More recent data suggests that, on average, EPL teams fly to 80% of their domestic matches, which has led to a national campaign to reduce this, called the 'Carbon Boot'.[29] For the clubs involved in international competitions – in the EPL, there are currently a minimum of seven of these in any given season – the additional use of air travel would increase emissions even further, so the average across the league is likely to be significantly higher (see section 3.2). Likewise, for catering, the figures varied markedly. Wolfsburg reported less than 200tCO_2e in 2021-22,[30] whereas Liverpool reported nearly 2,700tCO_2e.[31] Only one club reported merchandise-related emissions separately: Liverpool. They estimated these were nearly 117,600tCO_2e[32] – an enormous figure. All other clubs reported using a broader category – 'bought goods and services' – and none of the figures were remotely close to the Liverpool figure. The reason for reporting such a high figure seems to be due to Liverpool having an in-house merchandising subsidiary, but it still seems remarkably large. Another area of emissions is the broadcasting of matches – through TV or web-based services. There has been little research on this, but initial data suggests that watching a match on TV would lead to considerably fewer emissions than in person.[33] Based on the available data, and bearing in mind the wide variations, we estimated that the emissions of four of the six sub-categories were around 1,000tCO_2e each, and that team travel and especially merchandise were likely higher (possibly much higher). Overall, we estimated an average per club for 'other scope 3' emissions of 11,000tCO_2e.

The wide variation in reported GHG emissions for football clubs does highlight the importance of using a standardised reporting methodology. European football governing body, UEFA, launched an online 'Carbon Footprint Calculator' in March 2024[34] – based on the international standards laid down by the GHG Protocol (see Box 1.1). This is an important step – and should help reduce some of the variation discussed above – but there remain significant ambiguities and exclusions in areas such as the reporting of stadium construction emissions and spectator travel emissions,[35] which our assessment concludes are two of the largest categories.

In total, we estimated the carbon footprint of a typical tier 1 club to be about 40,000tCO_2e per year. This is equivalent to the annual emissions of about 28,500 average UK cars.[36] Our estimate is higher than two previous calculations,[37] mainly due to the greater availability of data. For EPL clubs – as an example – this implies average GHG emissions per match of about 1,700tCO_2e, assuming each team plays 38 league games and an average of 8 cup games per season (about 20% extra), and is responsible for half the emissions of each match (or all the emissions of each home match). Given the range of data in Table 2.1 and the uncertainties discussed above, we consider these estimates to be conservative – they could be more than 25% higher. Note also that these figures do *not* include international air transport – which we raise in Box 2.2 and explore in more detail in section 3.

2.3 What are the GHG emissions of the world's domestic football competitions?

The next question we consider is how this average estimate for a single elite club can be used to estimate the total carbon footprint for men's domestic football as a whole.

Since a key factor in the emissions of a club is spectator attendance at its matches – which strongly affects key parameters including spectator travel, stadium energy use, and catering – we use this as the basis for extrapolating emissions across clubs and leagues. So, if our 'typical tier 1 club' is in the EPL with an average attendance of about 40,000 per match[38] across its 38 league matches and 8 cup matches – then emissions of 40,000tCO_2e per club per season would be equivalent to 44kgCO_2e per single attendance. Similarly, if our typical tier 1 club is in the Bundesliga with an average attendance of about 43,000 per match[39] across its 34 league matches plus 7 cup games, then emissions per unit attendance would be very similar at 46kgCO_2e.

Adding together data from the 56 football leagues across the world which have an annual attendance of over one million gives a total of over 222 million.[40] This includes 42 tier 1 leagues, 11 tier 2 leagues, and 3 leagues from lower tiers. Using a slightly lower figure of 40kgCO_2e per unit attendance across these leagues – to account for the inclusion of non-tier 1 leagues – gives a total of nearly 9 million tCO_2e. By comparing data on spectator travel in the EPL to equivalent data from the lower leagues (tiers 3-10) of English football,[41] we can estimate that the top 56 leagues in the world account for about 90% of the total emissions of the sector. This implies that lower league clubs are responsible for about 1 million tCO_2e per year. Hence, we estimate the carbon footprint of the world's domestic club football competitions is about 10 million tCO_2e per year. This is equivalent – for example – to more than the total territorial emissions of a nation such as Rwanda.[42]

Again, it is worth pointing out that these figures do not take sufficient account of the role of air transport. Some clubs play in geographically large nations, such as the USA (whose tier 1 league also includes teams from Canada), Brazil, Japan, Argentina, China, and Russia. The long travel distances can thus lead to high levels of flying, by both teams and spectators. As a comparison, the furthest distance between two clubs in the EPL is approximately 500km (at the time of writing, this was Newcastle to Bournemouth), while the equivalent figure in the US Major League Soccer (West) is 3,200km (Vancouver to Houston). Hence, we think an additional 1 million tCO_2e per year should be added to the above total (equivalent to the air travel for about 1,000 matches per season at the European scale – see Box 2.2). This, we stress, is a first estimate and more detailed analysis should be undertaken. Although not among the largest leagues by attendance, Australia too has a famous 'distance derby' in its A-League, of 5,225km from Perth to Wellington in New Zealand, in which Perth Glory play Wellington Phoenix three times per year. To put that distance into perspective it's the equivalent of going from Helsinki to Mongolia.

The situation is similar for international club competitions – such as continental 'champions' leagues. Because of the importance of this issue, we will return to it in the next section on international competitions.

2.4 Reducing GHG emissions at club level

So, having identified the key sources of domestic football clubs' GHG emissions, what are the options for reducing them? And what targets and timetables should be set for these reductions? In this section, we give an overview with some examples of where clubs are taking action, mainly drawn from those listed in Table 2.1, and discuss how that action could be improved.

The first point to make is that, as we have discussed, the bulk of football-related emissions arise from the elite clubs, and so these are the organisations which should be leading action. However, initiatives from lower-league clubs can also help stimulate wider action – see Box 2.3.

Box 2.3 Forest Green Rovers – a leader in reducing GHG emissions

Forest Green Rovers is a small English football club* which is pioneering many low-carbon and other environmental initiatives, including the following.

- It was a founder member of the UN Sport for Climate Action framework (see section 2.4.2), and has been measuring and reporting its GHG emissions for over ten years. It aims to reduce its GHG emissions by 50% by 2030 – from 2018 levels – with further reductions after that year.
- 20% of its electricity use is generated by solar panels at its 'New Lawn' stadium, with the rest supplied by certified 100% renewable energy. It plans to increase the proportion of onsite renewable energy generation to 80% at a new stadium, currently under construction.
- Its new stadium, 'Eco Park', is being constructed from low-carbon building materials, mainly wood from certified sustainable sources. A range of energy conservation measures are also being incorporated. The stadium will seat 5,000 spectators and the site will include related facilities for its men's, women's and academy teams.
- The gas supply at its New Lawn ground is from certified 100% 'carbon neutral' sources.

- All food served at its stadium is plant-based.
- It encourages its fans to use public transport, electric vehicles, cycling, and walking to travel to matches. For example, it encourages use of a local 'park and ride' scheme, and provides numerous EV charging points and cycle parking. At its new ground, assistance for low-carbon options will be significantly expanded, including providing subsidies for match-day buses to link with local train services.
- It is trialling the use of electric vehicles (e.g. a minibus) for team and staff travel.
- It supports hybrid-working for the club's staff to reduce travel. Its pitch at the New Lawn is grown and maintained using only organic farming methods, e.g. no use of synthetic pesticides. This will also be the situation at Eco Park, together with several initiatives aimed at increasing biodiversity and carbon sequestration across the site.

* In the past ten years, it has competed in league tiers 3 to 5.

References
Forest Green Rovers (2023). Another Way. https://www.fgr.co.uk/another-way
Eco Park (2022). What's the plan? https://www.ecopark.com/about/

2.4.1 Emissions reduction measures

There are well-defined options for reducing the 10% of a club's carbon footprint which we estimate are covered by scope 1 (direct emissions) and scope 2 (mainly electricity-related emissions). Firstly, there are technologies which save energy and/or assist the switch away from fossil fuels. For example, installing LEDs for floodlighting and other stadium lighting etc can significantly reduce electricity use and thus GHG emissions. Clubs such as Wolfsburg and Spurs have installed these technologies. Another important example are heat pumps, which run on electricity. They are a leading technology for reducing GHG emissions from heating and hot water in buildings[43] – in most cases, they can be installed as a replacement for boilers using fossil gas (also known as 'natural gas') in tandem with other energy efficiency measures. Advanced heat pump models can provide cooling as well. Spurs have fitted heat pumps at their training centre. A club's travel-related scope 1 emissions can be significantly reduced by replacing company vehicles which run on petrol or diesel with battery electric vehicles (BEVs). Another option is to run club vehicles on biofuels made from waste vegetable oils – for example, Liverpool now uses hydrotreated vegetable oil (HVO) in its company vehicles. However, considerable care must be taken regarding the source of biofuels as many options – especially those produced from crops – can have environmental impacts which are comparable to or higher than the fossil fuels they replace.[44]

It is also important for clubs to switch away from fossil fuel-sourced electricity. Some clubs have taken the step of purchasing certified 'green' electricity, via 100% renewable energy tariffs through national electricity grids. Liverpool, Manchester City, Spurs, and Wolfsburg have all taken this step. However, care must be taken with such tariffs as there are numerous loopholes which can undermine their effectiveness. The complexities of these issues in the UK market has been discussed by Ethical Consumer[45] and Uswitch.[46] The best option is for clubs to generate their own electricity as far as possible using, for example, solar photovoltaic (PV) panels. These can be installed on club buildings, stadiums, over car-parks, or on other club-owned ground. Installing enough panels to generate – on average – the electricity used by a club over a year is the most effective option to reduce this category of GHG emissions to close to zero. Wolfsburg and Spurs have started to install some panels at their facilities.

Some clubs also encourage fans to save energy during their stadium visits – including Liverpool, Manchester City, Spurs, and Wolfsburg.

Reducing GHG emissions associated with stadium construction and renovation would obviously be lessened by minimising the building of any new stadiums. Renovation, using low-carbon materials and practices, should always be prioritised for any expansion or changes. Given the flurry of new stadium construction in the elite leagues of many European nations in 1990s and 2000s, at least in this geographical region, the justification for new build is particularly questionable, especially as the climate crisis worsens. Measures to restrict stadium new-build could be directed by national football bodies.

Reducing the other 75%-80% of a club's carbon footprint – according to our estimate – is rather more difficult. Of central importance here will be a combination of changes in fan behaviour and football competition re-organisation, both of which face significant obstacles.

As spectator travel makes up the largest proportion of domestic football emissions – 50% of our estimate – this deserves a particular focus from clubs. The first step is to survey fans on matchday to understand their travel behaviour – the distances they have travelled, the modes of transport they have used, and whether their trip has led to accommodation use, e.g. hotel. This is of course necessary to estimate existing GHG emissions – so most of the clubs discussed in section 3.2 have started to do this – and this gives a baseline against which progress can be measured. The next step is to draw up a sustainable travel plan – which maps out how fans will be encouraged and supported in prioritising walking, cycling, buses, trams, trains, and shared car use over single-occupancy car use and planes. Options include: better information provision – e.g. public transport guidance and walking/ cycling routes on club websites; and financial incentives – e.g. ticket discounts for non-car users or parking discounts for BEVs. Matches could also be timed to better integrate with local public transport options. From the evidence we have looked at, Spurs and Wolfsburg seem to have implemented the most well-developed sustainable travel plans so far among elite clubs.

A key mitigation option which is rarely considered is to provide incentives *not* to travel. This is especially important when travel distances to away games are long and may involve air travel. The rise of 'fan zones' for major international matches – when fans can view a game on a giant TV screen in a local public square, or indeed at their home stadium – offers a useful model which could be more widely applied. It may seem counter-intuitive to encourage fans not to travel to an away match – but the urgency and scale of the climate crisis demands a major rethink of what is considered 'normal' behaviour. Indeed, a former head of social responsibility at European governing body UEFA recently suggested that tickets should no longer be issued to away fans for international club competitions to help reduce GHG emissions.[47]

Another option which is rarely considered by football's national governing bodies is the potential to 'regionalise' competitions to reduce travel. This is especially important in larger nations which do not have well-developed surface public transport options, such as the USA and Brazil. As mentioned earlier, the UK offers a useful model here – with independent leagues in England, Scotland, Wales, and Northern Ireland. It should be noted, however, that the top teams in Wales in fact play in the English competition, travelling extensively. While Major League Soccer in the USA and Canada is broken up into Western and Eastern Conferences, the travel distances between clubs remain very high, so further regionalisation should be explored.

A further option to significantly reduce spectator travel is for national governing bodies to slightly reduce the number of teams in the tier 1 leagues. For example, the EPL, Italy's Serie A, and Spain's La Liga each include 20 teams playing a total of 380 matches per season. Reducing the size of these leagues to 18 teams – the same size as the Bundesliga or France's La Ligue – would reduce the number of matches per season to just 306. We return to the issue of spectator travel in section 3.

Regarding mitigation of other scope 3 (indirect) emissions – including merchandise, travel by players and club officials, and venue catering – there are several options. Some teams are starting to sell club merchandise – e.g. football shirts – made from recycled materials. This is a start, but the football sector needs to put more effort into reducing its contribution to unsustainable levels of material consumption. If Liverpool's enormous estimate of the carbon footprint of its merchandise is found to be even close to being accurate (see section 2.2), then there could be larger than expected savings here. Reducing the number of 'collectables' sold would be very helpful, e.g. by keeping jersey designs for several years as some clubs already do, as well as offering instead more 'experiential' options – such as meeting players and stadium tours. Again, changes to fan behaviour and club business models need to be pursued. On catering, GHG emissions can be most effectively reduced by minimising food waste – e.g. by ending the sale of 'extra-large' portion sizes – and moving to menus which are predominantly plant-based and seasonal/local. Liverpool, Manchester City, Spurs, and Wolfsburg have all increased their provision of these foods. Forest Green Rovers has gone further – by only serving plant-based food at their stadium and other facilities. Reducing the emissions of travel by club officials has been largely covered by options discussed above.

2.4.2 Targets and timetables

The United Nations launched the Sports for Climate Action Framework (S4CA) in 2018, with the following main targets and timetables:[48]

1. **Reduce GHG emissions (scopes 1, 2 and 3) by 50% from baseline by 2030 at the latest;**
2. **Reduce GHG emissions (scopes 1, 2 and 3) to net zero by 2040.**

The preferred baseline year specified was 2019, although the "latest year for which data was available" was also acceptable. Importantly, the S4CA allowed for widespread use of 'compensation' measures, such as carbon offsets, to be used to contribute to meeting the targets. This has proven to be especially controversial due the numerous loopholes involved – see Box 2.4.

The foremost international guidance on target-setting for GHG emissions at the organisational level has been developed by the Science-Based Targets initiative (SBTi), through its 'Corporate Net-Zero Standard'.[49] This aims to help keep global temperature rise close to 1.5°C. The largest difference between this standard and the S4CA is that compensation measures – what it labels 'Beyond Value Chain Mitigation (BVCM)' – are not allowed to be used to meet its targets. It stills sees BVCM as valuable action – but this should be *in addition* to reductions in scope 1-3 emissions.

At the time of writing, both the S4CA and the SBTi are undergoing review, not least because of the lack of progress in reducing global GHG emissions over the last decade or so. It is clear that rather more stringent targets are now needed. As we highlighted in section 1, at the current global emissions rate, the world is likely to 'exceed the global carbon budget' by 2027, meaning that the Paris target of 1.5°C will be exceeded a few years later.[50] Some scientists have argued that wealthier nations and organisations should therefore be setting targets of about 90% reductions by 2030, to reflect a 'fair shares' approach to climate action.[51] Clearly, this would be very challenging. It is also necessary for the widespread use of carbon offsets to halted.

We will return to the issue of suitable GHG targets for the whole football sector in section 6.

In the meantime, the S4CA remains an important starting point for clubs, competitions, and national football associations. Some of the world's top leagues (see section 2.1.2), and clubs within those leagues, as well as national associations, have signed up to this framework. Table 2.2 lists these, at the time of writing.

Table 2.2 Leading league competitions, national associations, and clubs signed up to UN Sport for Climate Action Framework[52]

Nation	National associations/ Leagues	Clubs
England	The Football Association, Premier League	Arsenal,[53] Brighton and Hove Albion, Bristol City, Liverpool, Millwall, Newcastle United, Nottingham Forest, Oxford United, Southampton, Spurs, Watford, Wolverhampton Wanderers
Germany	Deutscher Fussball-Bund	Koln, 1899 Hoffenheim, Werder Bremen, Wolfsburg
Spain	La Liga	Atletico de Madrid, Real Betis Balompie
Italy	-	Roma, Juventus
USA	-	-
France	-	Saint Etienne
Brazil	-	-
Mexico	-	-

This is a disappointingly small proportion of the total number of possible members. Even the best represented league – the English Premier League – has fewer than half of its clubs signed up.

As mentioned, Wolfsburg is one of the clubs that has taken a leading role in efforts to tackle its carbon emissions. However, its targets are also an example of the shortcomings of the S4CA. It is aiming to be "net zero by 2025"[54] which, on the face of it, is commendably ambitious. However, actions to meet this target include a large proportion of compensation measures. If we exclude those, Wolfsburg's near-term target for scope 1-3 emissions is actually a 55% reduction by 2030[55] with ambiguity over its 2040 net-zero target.[56] Other clubs are even further behind in their climate action.

In summary, men's domestic football competitions are a significant global source of GHG emissions, which we have estimated to be about 11 million tCO_2e per year. The top 56 leagues – whose annual attendances number over one million – are responsible for over 90% of this total. Efforts to reduce these emissions at a club level are still at a disturbingly early stage, despite the severity of the climate crisis, so a considerable increase in the level of action is required. Given the huge cultural influence that football has in society, elite clubs have a particular obligation to take a lead in cutting emissions – and encouraging and supporting their fans to be a key part in this through, for example, behaviour changes in areas such as transport (especially reducing car and air travel), consumer goods (including reducing the purchase of merchandise), and food (including increasing consumption of plant-based options).

Next we turn to the issue of emissions from international competitions, before moving on to the area of high carbon sponsorship.

Box 2.4 **Carbon offsets and other compensation measures**

As the direct costs of reducing GHG emissions can be significant, nations and organisations have explored the possibility of cheaper alternatives. Back in 1997, the Kyoto Protocol – a key climate treaty – first allowed 'flexibility mechanisms' to be used by nations to help achieve their GHG emissions reduction targets for the period up to 2012.[i] These mechanisms became known as 'carbon trading' or 'carbon offsetting'. Nations then allowed them to be used by businesses – and this use continues to this day. However, from the start, carbon offsets have been controversial – due to serious loopholes – and there is now strong pressure to severely restrict their use.

In short, carbon offsets are a system of credits earned when one organisation pays another to reduce GHG emissions on its behalf. So, for example, instead of a football team reducing emissions by reducing its use of air travel, it pays another organisation to install some solar panels which replace fossil fuel-generated electricity, thereby reducing its emissions by an equivalent amount instead. In theory, advocates claim, this system is more economically efficient.

However, there are numerous loopholes.[ii] Perhaps the most important problem is that the emissions reduction estimated for the offset project is predicted for years into the future – yet all of it can be credited to the purchaser today. So the amount of offsets produced is speculative and long-term, but it is treated as certain and immediate. Another problem concerns the use of forestry projects as offsets – where carbon dioxide is absorbed by trees as they grow. Trees take decades to grow to maturity – so again there is the problem of accurately projecting events far into the future – but also trees are also vulnerable to future climate change. So, for example, if there is a wildfire, all the emissions taken up by the trees will be immediately released back into the atmosphere – reversing the planned reductions. The other main problem is that organisations have spent so much effort avoiding significant reductions to their own emissions that the 1.5°C climate target will soon been breached (see Box 1.1). This is why robust schemes, such as the Science-Based Targets initiative (see main text), argue that organisations across society need to reduce their own emissions in line with clear 1.5°C-compatible pathways.

Perhaps the most high profile use of carbon offsets in football has been for recent World Cup Finals. For example, in Qatar in 2022, the organisers claimed that the tournament was going to be 'carbon neutral' due to the use of carbon offsets.[iii] This was criticised at the time by leading climate scientists who described it as "misleading and incredibly dangerous",[iv] while regulators later concluded the claim broke advertising law, and instructed the organisers not to repeat it.[v]

This is not to say that football organisations should not fund projects which help to reduce GHG emissions in the wider community. It only means that they should not count potential reductions from these projects towards their own targets. Schemes such as these are increasingly known as 'carbon compensation' projects. Two ingenious examples are run by Pledgeball[vi] and Planet League.[vii] These encourages football fans – grouped by the team they support – to compete to reduce their personal GHG emissions. So project organisers encourage fans to undertake a number of actions – e.g. line-dry their washing rather than use a tumble-dryer, or eat a plant-based meal rather that one high in animal products – and decide the winners according to a corresponding estimate of the emissions saved by each 'team'. Given the difficulties that governments have in encouraging climate-friendly behaviour change across society, this could have a significant positive impact.

References

i. Jackson T, Begg K, Parkinson S (eds.) (2001). Flexibility in Climate Policy: Making the Kyoto mechanisms work. Earthscan: London.
ii. For a more detailed discussion, see: New Weather Institute et al (2022). Caught Offside with Offsets? Why offsetting won't solve sports' climate problem. December. https://www.badverts.org/reports-and-toolkits
iii. FIFA (2022a). FIFA President shows Green Card for the Planet. 5 June. https://inside.fifa.com/social-impact/sustainability/media-releases/fifa-president-shows-green-card-for-the-planet
iv. BBC Sport (2022). Qatar World Cup: Fifa's carbon neutrality claim 'misleading and incredibly dangerous'. 2 November. https://www.bbc.co.uk/sport/football/63466168
v. The Guardian (2023a). Fifa misled fans over 'carbon-neutral Qatar World Cup', regulator finds. 7 June. https://www.theguardian.com/football/2023/jun/07/fifa-carbon-neutral-qatar-world-cup-misled-fans-swiss-regulator
vi. Pledgeball (2024). Support your club. Protect Where We Play. https://pledgeball.org/
vii. Planet League (2022). Scope F: Maximising sport's positive impact on carbon emissions. https://www.scope-f.com/

3. GHG emissions of men's international competitions

In this section, we examine the GHG emissions of the men's international football competitions. First, we look at those involving national teams, and then those involving clubs.

3.1 International competitions involving national teams

Obviously, the largest competition involving national teams is the World Cup. Organised by FIFA, this is held on a four-year cycle, with qualification matches played across six continental regions over a two-year period, followed by a month-long finals tournament in a single nation or nations. The qualification stage is generally run in the form of small leagues, with typically four to six teams, and the finals tournament starts with a small league or 'group' phase, followed by a knock-out phase.

Each of the six continental regions also hold their own competitions on multi-year cycles, some with qualification matches and finals, and some just holding a finals tournament. The geographical regions and their football organising bodies are shown in Table 3.1.

For various political and practical reasons, these regions contain slightly different countries to the commonly recognised geographical continents. For example, Israel, Turkey and Russia are part of the European competition, and Australia is part of the Asian one. To further complicate matters, some competition organisers have started to invite national teams from other continents to compete in their tournaments to increase revenue. The most notable example is the Copa America organised by CONMEBOL – the world's oldest continental football competition – which was originally played between South American national teams. However, from the early 1990s onwards, it started to invite competitors from the rest of the Americas and a few from Asia as well. This has obviously driven up GHG emissions due to increased air travel. A further complexity is that the regional competitions rotate on different multi-year cycles. So, for example, the European Championship follows a four-year cycle and the Africa Cup of Nations follows a two-year cycle but, over the past 20 years, the cycle of the Copa America has varied between one year and four years

3.1.1 GHG emissions of the World Cup

3.1.1.1 Emissions due to World Cup Finals

Since 1998, the Finals tournament of the World Cup has involved 32 national teams playing a total of 64 matches in one or two nations. Official estimates of the GHG emissions due to this tournament have been compiled since the 2006 edition in Germany. Table 3.2 summarises the key data from those studies. All estimates were compiled in advance ('ex-ante'), with no adjusted data based on the real world event being published afterwards ('ex-post').

Table 3.1 Geographical regions and organising bodies for international football tournaments

Geographical region	Organising body
World	**FIFA** (Fédération Internationale de Football Association)
Africa	**CAF** (Confederation of African Football)
Asia	**AFC** (Asian Football Confederation)
Europe	**UEFA** (Union of European Football Associations)
North America, Central America, and the Caribbean	**CONCACAF** (Confederation of North, Central America and Caribbean Association Football)
Oceania	**OFC** (Oceania Football Confederation)
South America	**CONMEBOL** (Confederación Sudamericana de Fútbol)

Table 3.2 Official assessments of GHG emissions of World Cup Finals, 2006-2022

Year	Host nation	Total	Transport	Venues	Accommodation	Merchandise	Other	Transport
2006	**Germany***	0.09	0.07	0.01	0.01	na	na	79%
2010	**South Africa**	2.75	2.38	0.03	0.34	na	0.00	86%
2014	**Brazil**	2.72	2.28	0.26	0.16	0.02	0.01	84%
2018	**Russia**	2.17	1.60	0.25	0.25	0.06	0.01	74%
2022	**Qatar**	3.63	1.88	0.97	0.73	0.02	0.04	52%

Data from
FIFA (2006). Green Goal: Legacy Report - FIFA World Cup Germany 2006. https://www.oeko.de/oekodoc/292/2006-011-en.pdf
DEAT (2009). Feasibility study for a carbon neutral 2010 FIFA World Cup in South Africa. Dept for Environmental Affairs and Tourism, Republic of South Africa. https://www.dffe.gov.za/sites/default/files/docs/carbonneutralwc_feasibility_study.pdf
FIFA (2013). Summary of the 2014 FIFA World Cup Brazil Carbon Footprint. https://digitalhub.fifa.com/m/24745b6eaad3c7a7/original/kcvvlnivbq3gs9ksnagy-pdf.pdf
FIFA (2016). FIFA World Cup Russia 2018: Greenhouse gas accounting report. https://digitalhub.fifa.com/m/a96fa2c95a79242/original/bs36nsonccbtfs5v7ppu-pdf.pdf
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* Emissions in the 2006 tournament excluded international travel, hence the total was considerably smaller.

The first thing to note is that the GHG accounting methodology changed substantially after the assessment of the German tournament. In that competition, emissions from international travel were specifically excluded, meaning that the total was less than 5% of the others. Other methodological changes have happened over time as well – especially related to GHG emissions due to stadium construction – and hence comparisons between tournaments must be carried out with care.

Regarding transport emissions – the largest fraction of the total – in general, these have been calculated based on future projections of: (i) the total number of tickets sold; (ii) the average number of tickets bought by each attendee (fan); (iii) the average travel distance by each attendee from their country of origin to the host nation; (iv) the average travel distance by each attendee for each match within the host nation; (v) the proportion of journeys made by each major mode of transport (e.g. air, rail, bus, car); and (vi) the GHG conversion factors for each mode of transport. Assumptions about fans' countries of origin have been based on the geographical spread of teams which qualify for the finals. We have carried out our own simplified calculations of the transport emissions based on ex-post attendance data from the tournaments and have concluded that the official estimates for transport emissions are credible.

The data in Table 3.2 reveals some initial findings, as follows.

- Reported GHG emissions of a World Cup Finals tournament since 2010 have averaged about 2.8 million tCO_2e. This averages out at about 44,000tCO_2e per match, equivalent to the annual emissions of about 31,500 average UK cars.[57] This is about 26 times the amount for an average game in an elite domestic league (see section 2.2). Note that this is based on very conservative assumptions for the emissions contribution from the construction of new stadiums (see later).
- Transport is by far the largest contributor to this, averaging around 75% of GHG emissions.
- Venues (mainly stadium operation) and accommodation also make significant contributions.

More detailed examination of the tournament data reveals two further findings. The first is that air travel – both international and domestic – makes up about 90% of transport-related GHG emissions – see Table 3.3. This is critical as it means that air travel is likely to be the largest single contributor to the tournaments' emissions. It is also the most difficult to reduce.

The second further finding is that the accounting methodology used for dealing with the GHG emissions of stadium construction is open to question, and decisions made on methodological aspects substantially affect the size of estimate.

Graph 3.1 Percentage of transport GHG emissions due to air transport at men's World Cup Finals, 2010-2022

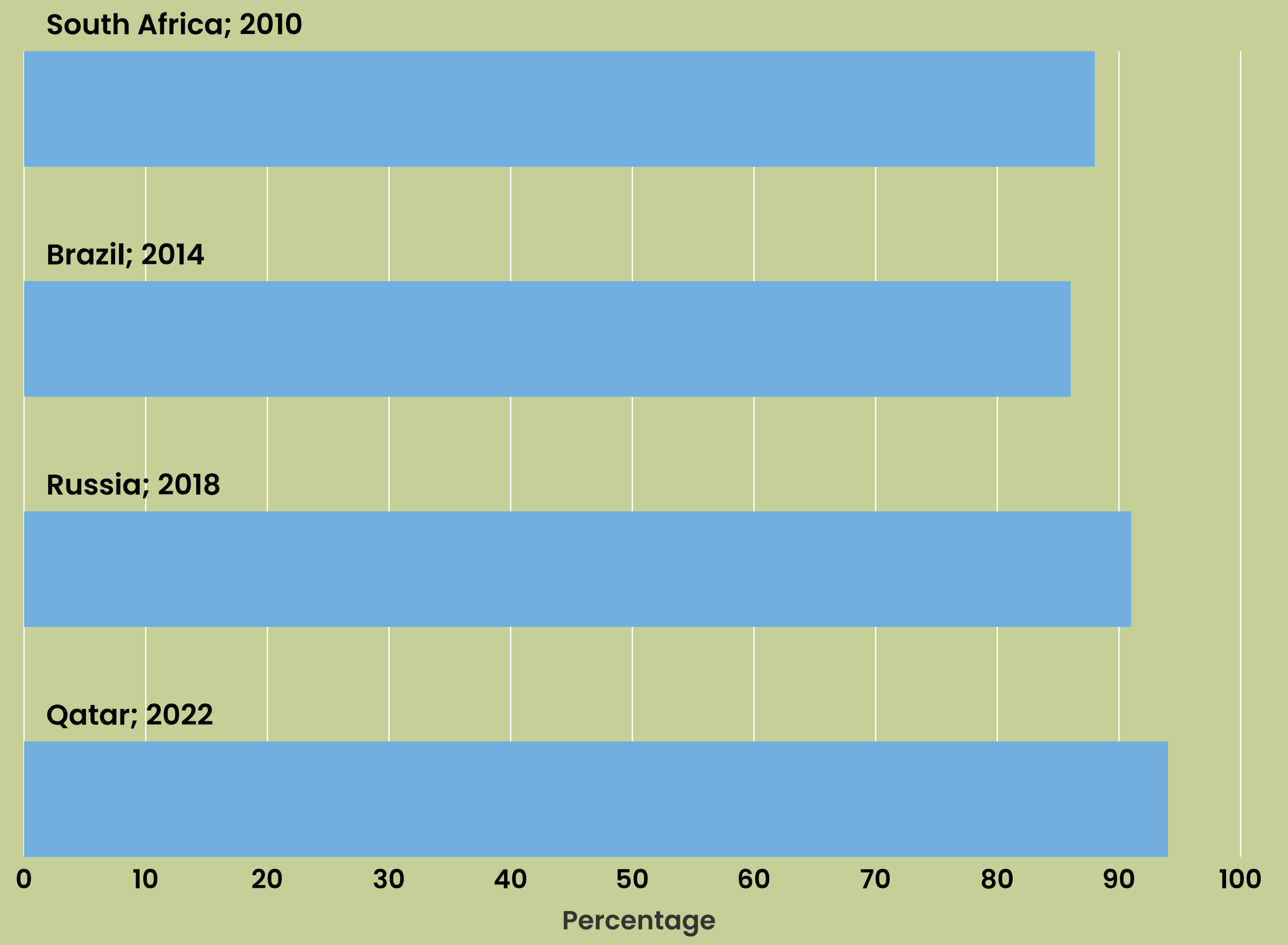


Table 3.3 GHG emissions due to air transport, men's World Cup Finals 2010-2022

Year	Host nation	GHG emissions due to air transport ($MtCO_2e$)	Percentage of transport emissions due to air travel
2010	**South Africa**	2.09	88%
2014	**Brazil**	1.95	86%
2018	**Russia**	1.46	91%
2022	**Qatar**	1.76	94%
Average		**1.82**	**90%**

Notes
Data from: DEAT (2009). Op. cit.; FIFA (2013). Op. cit.; FIFA (2016). Op. cit.; FIFA (2021b). Op. cit.
Figures for air travel at the Brazilian and Russian tournaments were not fully specified in the official reports, hence we have estimated these based on indirect data on the tournament. We concluded that the figures for the Qatari and South African tournaments were more robust. However, greater openness on the assumptions used in the official GHG analyses would be beneficial. (This issue will be discussed further in a follow-up report.) A further issue is that sizeable numbers of fans tend to fly to major tournaments even though they do not have match tickets – leading to potentially significant underestimates of travel emissions – see, for example: Carbon Trust (2024). https://www.carbontrust.com/news-and-insights/insights/more-than-a-game-tactics-for-reducing-a-tournaments-carbon-footprint

Table 3.4 **Data on stadium construction, World Cup Finals 2006-2022**

Year	Host nation	Number of new stadiums constructed	GHG emissions due to construction of one typical stadium (tCO_2e)	GHG emissions included for all stadium construction in total (tCO_2e)
2006	**Germany**	6	57,000	4,000
2010	**South Africa**	5	207,000	15,500
2014	**Brazil**	7	na	0
2018	**Russia**	9	na	0
2022	**Qatar**			
	permanent	6	270,000	4,500
	temporary	1	438,000	438,000

Notes
All figures rounded.
Main data from: FIFA (2006). Op. cit.; DEAT (2009). Op. cit.; FIFA (2013). Op. cit.; FIFA (2016). Op. cit.; FIFA (2021b). Op. cit..
Additional data from CMW (2022). Op. cit. and Wikipedia's World Cup Finals pages.
Renovated stadiums and temporary structures and their related emissions are not included in the table – except for the temporary stadium in Qatar.

Table 3.4 exemplifies these issues. For the previous five World Cup Finals, the host nations have been required to build between five and nine new stadiums each. Such construction leads to significant GHG emissions – latterly, over 1 million tCO_2e. If these had been fully included in the GHG accounts for these tournaments, they would have increased the total by between 40% and 100%. However, they have not. The argument made is that these stadiums have been built to last up to 60 years,[58] providing a venue to be used after the World Cup as well as during it. Assessors have approached this issue in different ways. In the 2006 and 2010 assessments, a fraction of the embodied emissions of *all* stadiums used in the tournament was included – equivalent to the fraction of the stadiums' lifetimes during which the World Cup Finals were held – regardless of whether they were already built or not. In the 2014 and 2018 finals, these emissions were simply ignored. In the 2022 assessment, a small proportion of the embodied emissions of the newly-constructed stadiums was included, equivalent to the fraction of the lifetime of the stadiums used for this tournament.[59]

There are significant arguments that can be made that these assessment methodologies are inadequate. The main ones are that a World Cup construction programme can cause:

- stadiums to be built that might otherwise not be built to meet host nation sporting use;
- stadiums to be built with larger seating capacities than needed for long-term use; or
- stadiums to be built in locations that are not suitable for long-term use.

For example, post-tournament under-utilisation has been a common problem for stadiums built for the South African, Brazilian, and Russian World Cups.[60] It was intended that many of these lessons would be learnt when staging the 2022 competition in Qatar. So, for example, removable seating was installed in some stadiums, and one stadium was built to be dismantled at the end of the tournament to be reused in another competition. However, an investigation of the situation in August 2024 revealed worryingly similar failings: under-utilisation of permanent stadiums, and the temporary stadium – which incomplete data indicates could have led to more emissions during construction than the permanent ones (see Table 3.4) – is still standing and unused.[61] Indeed, the overriding problem with the Qatar competition was that stadiums were built in a country and region with very few large football clubs or a mass public following. One partial solution that local officials have pursued is that the country now specialises in hosting international football tournaments – but these, of course, are heavily reliant on air travel for fans and teams. This is not a low carbon legacy for the sport or the planet.

Hence, we argue that a much greater proportion of the stadium construction emissions – up to 100% – should be counted as World Cup-related emissions in the FIFA sustainability assessments. The exact proportion should depend upon rigorous assessment of whether and when a comparable stadium might have been built to cater for the domestic sporting audience in that nation.

A key aim of this study is to estimate the total GHG emissions of the entire global football sector, so we will count football stadium construction emissions *in full* whenever and wherever they occur (see also the estimates in section 2.2). Hence, for recent World Cup Finals, we will include average GHG emissions of 1.8 million tCO_2e for stadium construction – based on figures from Table 3.4. We note that this inclusion would imply that an average match at the tournament would be responsible for about 72,000tCO_2e – about 64% higher than the earlier estimate based on official data. This would be equivalent to the annual emissions of about 51,500 average UK cars[62] – and about 42 times the amount for an average game in an elite domestic league (see section 2.2).

One final issue should be discussed in relation to GHG emissions accounting for World Cup Finals: the use of carbon offsets. As we discussed in Box 2.4, carbon offsets are regarded by many climate scientists as a deeply flawed approach to emissions reduction, and so their use should be avoided. Due to the difficulty of reducing emissions from air travel, World Cup organisers have increasingly relied upon offsets to give the appearance of climate action rather than take steps to reduce air travel emissions directly. For example, organisers of the Qatar World Cup claimed that the event would be 'carbon neutral' due to the use of offsets. However, regulators later concluded the claim broke advertising law, and instructed the organisers not to repeat it.[63] We discuss actions that can lead to actual reductions in air travel emissions in section 3.4.

3.1.1.2 Emissions due to World Cup qualification

As yet, no official attempt has been made to estimate the GHG emissions of the regional qualification stages of the World Cup competition. This is quite a serious omission since this phase involved – for the 2022 tournament – 206 teams playing a total of 865 matches over a three-year period up until the finals.[64] This is more than 13 times the number of international games played than in the finals themselves. However, average attendance per match tends to be lower than at the finals, even though England have still attracted crowds of over 70,000 at qualifiers, and travel distance tends to be a lot shorter, at least for home fans.

Hence, in this study, we have produced first estimates for the GHG emissions of the qualification rounds of the two most recent World Cup tournaments in 2018 and 2022 – see Table 3.5. To do this, we have focused on the air transport component as the data above for the finals shows that this represents the largest proportion. We used the following key data:

- number of matches played in each of the six geographical regions (see Table 3.1) covered by the qualification matches;[65]
- average match attendances for these matches;[66]
- average flight distances for each geographical region;[67] and
- GHG conversion factors for air transport.[68]

We assumed that away fans made up 5% of attendances – which is the minimum ticket allocation used by UEFA, and likely to be a conservative estimate – and that all away fans travelled by air.

In order to estimate GHG emissions of 'other' sources, for simplicity, we have assumed these are one-third of the total, in line with data above from the World Cup Finals. This is a crude estimate, so we encourage a more detailed assessment by official football confederations and others.

Table 3.5 **Estimated GHG emissions for qualification rounds of World Cups, 2018 and 2022**

$MtCO_2e$	2018: Russia	2022: Qatar
Air transport	1.26	0.62
Other sources	0.63	0.30
Total	1.89	0.92

As can be seen in Table 3.5, there is a large difference between the estimates for the 2018 and 2022 tournaments. This is entirely due to reduced attendances in 2020 and 2021 due to the COVID-19 pandemic (the numbers were roughly halved).

3.1.1.3 Total emissions for World Cup tournaments

Bringing together all the data in Tables 3.2-3.5, we can make an estimate of the GHG emissions of a 'typical' men's World Cup tournament – including both qualification and finals during a four-year cycle – over the past decade or so. This is shown in Table 3.6. As shown, the main sources fall in three categories: air transport; stadium construction; and 'other' sources. The latter category includes surface transport, renovation of existing stadiums, accommodation, energy use at all venues, catering, merchandise etc. The total emissions for the whole tournament cycle is estimated to be 6.5MtCO_2e – an average of just over 1.6 million tCO_2e per year.

These calculations can be used to help estimate the GHG emissions of future World Cup tournaments, and this will be carried out in a follow-up briefing. Other factors relevant to such calculations are discussed in section 3.4.

3.1.2 GHG emissions of regional national competitions

As mentioned earlier, the six continental football confederations also run their own competitions for national teams, with key details relevant to estimating GHG emissions listed in Table 3.7. The structure of the tournaments is similar to the World Cup, featuring a qualification stage (where numbers justify it) and a finals stage. The format is generally a combination of league and cup structures.

Graph 3.2 Estimated GHG emissions for typical men's World Cup tournament, including qualification and finals of 32 teams

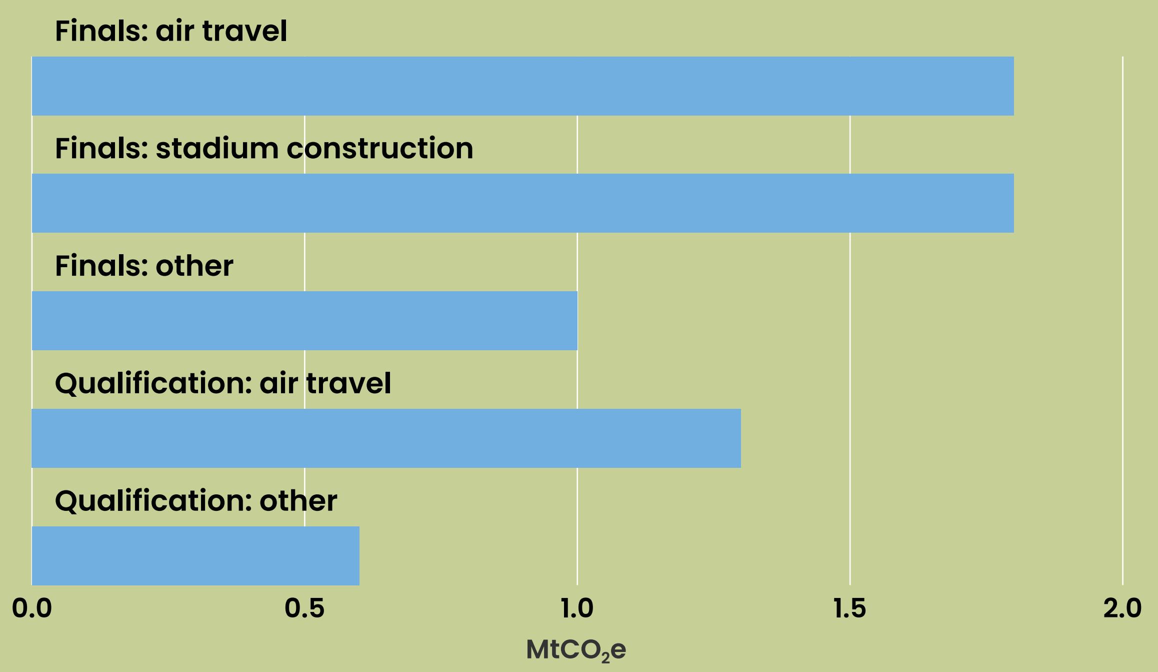


Table 3.6 Estimated GHG emissions for a typical World Cup tournament, including qualification rounds and a finals tournament involving 32 teams

Main data source	GHG emissions ($MtCO_2e$)
Finals	
Air travel	1.8
Stadium construction	1.8
Other sources	1.0
Qualification	
Air travel	1.3
Other sources	0.6
Total	**6.5**
Total per year	**1.6**

Notes
All figures are rounded to one decimal place.

Table 3.7 Continental tournaments for national football teams, including key statistics

Region	Tournament	Timescale	Stage	No of matches	Total attendance	Typical travel distance (km)
Africa	Africa Cup of Nations	2y	Finals	52	1,110,000	4,200
			Qualification	142	na	4,200
Asia	Asian Cup	4y	Finals	51	1,508,000	6,700
			Qualification	208	*2,080,000	6,700
Europe	European Championships	4y	Finals	51	2,681,000	1,400
			Qualification	239	5,312,000	1,400
North America, Central America and the Caribbean	CONCACAF Gold Cup	2y	Finals	31	1,015,000	3,500
			Qualification	68	na	3,500
Oceania	OFC Nations Cup	4y	Finals	15	41,000	2,500
South America	Copa America	1-4y	Finals	32	1,572,000	3,600

Notes and references
Data on the number of matches and total attendances is for the most recent tournaments, at the time of writing – Africa: 2023/4; Asia: 2023/4; Europe: 2024; North America: 2023; Oceania: 2024; South America: 2024. The Copa America has generally not included a qualification phase, but in the 2024 tournament two qualifying matches were played – data on these has not been included. Data marked with * has been somewhat affected by COVID-19 pandemic. All data is taken from the relevant tournament pages on Wikipedia, where detailed sources can be found.
Typical travel distances are for away fans and illustrative, based on the flight distances between the centre and periphery of each region. The travel distances for the Copa America are based on the continent of South America, but with the recent admission of teams from outside the region, this is conservative.
Figures are rounded: attendances to nearest thousand; travel distances to nearest hundred.

As far as we can ascertain, official estimates of GHG emissions have only been compiled for the finals stage of the European Championships. It is disturbing that none of the other confederations have prioritised measuring any of their GHG emissions – neither the finals nor the qualifiers. The data for the 2024 European tournament in Germany is given in Table 3.8, with a total of just under 0.5 million tCO_2e. As for the equivalent estimate for the World Cup Finals, this was compiled far in advance of the actual tournament. It should also be noted that no new stadiums were built for this event – but, for many tournaments, this will not be the case.

Table 3.8 Official assessment of GHG emissions of EUROs Finals, 2024

Source	GHG emissions (MtCO_2e)
Transport	0.41
Venues	0.01
Accommodation	0.06
Merchandise	0.01
Other	0.00
Total	**0.49**
% Transport	84%

Reference
Oko-Institut (2022). Concept and Feasibility Study for a "Climate Neutral" UEFA EURO 2024. https://www.oeko.de/fileadmin/oekodoc/Climate-Neutral_EURO2024_en.pdf

Comparing this data with that above from the World Cup Finals, a few elements stand out. Transport emissions again dominate – with the percentage similar to those given in Table 3.2, especially when stadium construction emissions are excluded from all the totals. The transport total is about 20% of the World Cup average due to the much shorter travel distances for international fans. Our further analysis indicates that air travel emissions represent a very large fraction of the transport emissions – as in the World Cup cases.

How might the GHG emissions of other continental tournaments compare with the European case? The figures in Table 3.7 show that:

- For the African and North American Finals: match attendances were about 60% lower, the tournaments took place at twice the frequency, and the travel distances for away fans were around three times the size;
- For the South American Finals: match attendances were 40% lower, the tournaments took place at a higher frequency, and the travel distances for away fans were at least three times the size;
- For the Asian Finals: match attendances were about 40% lower, tournament frequency was the same, and travel distances for away fans were around five times the size; and
- For Oceanian Finals: the attendances were 98% lower and so its emissions can be considered negligible for this assessment.

Since air transport is the dominant factor, we estimate that the total GHG emissions of the African, Asia, North American, and South American tournaments over a four-year cycle are about double those of the European competition. This is, of course, quite a crude first estimate.

Concerning the qualification stages of these tournaments, there is only patchy data for attendances, but this does seem to indicate that they were significantly lower than for World Cups. Since we estimated in the previous section that qualification emissions were around 40% of those related to the finals (Table 3.6), we estimate for regional tournaments, this is only 20%.

In total then, over a four-year cycle, we estimate the GHG emissions of these tournaments was around 5.2 million tCO_2e – which is 1.3 million tCO_2e per year. This is a little smaller than our estimate for the World Cup. Again, we emphasise this is a first estimate which should be verified by more detailed analysis.

In addition, there are other international matches which attract significant crowds. For example, UEFA runs the Nations League, which takes place over a two-year cycle. The 2022-23 competition involved 162 matches with a total attendance of 3.2 million.[69] Then there are international 'friendly' matches – not part of any competition – of which there are about 300 games per year, but attendances tend to be much smaller.[70] Again, we suggest a first estimate: about 0.2 million tCO_2e per year.

3.2 International competitions involving clubs

The world's top clubs routinely play in international competitions. While these are more common in Europe, their popularity is growing in other continental regions.

At the global level is the Club World Cup (CWC) organised by FIFA. In recent years, this has been an annual competition involving seven teams playing seven matches in one host nation. From 2025, it is planned to involve 32 teams playing 63 matches – but played only once every four years.

At the European level, annual competitions are organised by UEFA. The main ones are the Champions League, the Europa League, and the Conference League. These involve a large number of clubs playing a large number of matches in a combination of both knock-out and small league formats. From the 2024-25 season onwards, the format of all three competitions has changed to markedly increase the number of games. For example, the Champions League in 2023-24 involved 78 teams playing 125 matches.[71] While the number of teams is only increasing slightly, the number of matches is rising to 189, a 51% increase.[72] With an average attendance of over 50,000 per game, this rise will lead to a large jump in GHG emissions. These figures do not include the qualification matches which, although having smaller crowds, will increase the GHG emissions even more.

Other international confederations have their own competitions.[73] For example, in South America, the Copa Libertadores involves 155 matches per season with an average attendance of 25,000. In Asia, the Champions League involves 150 matches per season – but the attendance per match is only about 10,000. In Africa, only 60 matches are played in their Champions League, and only 30 matches are played in the CONCACAF competition.

As discussed in section 2, international competitions can markedly increase GHG emissions as they cause teams and many away fans to fly. For a given match at tier 1 level in Europe – see Box 2.2 – this increases emissions by at least $900tCO_2e$ – which is a 50% rise over the level for an equivalent domestic game. For the three European competitions over the 2023-24 season, we estimate that this led to additional GHG emissions of about 0.4 million tCO_2e per year compared with an equivalent number of domestic games. For the 2024-25 season, we estimate these additional emissions will be 0.5 million tCO_2e per year – 0.1 million tCO_2e higher than the previous season due to the rise in the number of games. These figures are consistent with an analysis carried out recently by researchers at BBC Sport.[74] These figures do not include the increase in other GHG emissions (e.g. due to surface travel or stadium operations) due to the rise in the total number of games played per season across Europe due to the expansion of these three competitions. We will examine this issue in a follow-up briefing.

As for the additional GHG emissions caused by the air travel induced by all other global and continental club competitions, we estimate this to be a further 0.5 million tCO_2e per year. This is another initial estimate and we encourage further analysis.

3.3 What are the GHG emissions of the international football tournaments?

Table 3.9 summarises the estimates of GHG emissions due to men's international football tournaments involving national teams and clubs, as discussed in this section. The figures for club tournaments are additional to those of domestic football discussed in section 2. The figures apply for competitions up to the 2023-24 season. Further analysis of emissions for tournaments from 2024-25 onwards will be covered in a follow-up briefing.

Table 3.9 Additional GHG emissions due to international football tournaments (up to 2023–24)

Tournament	Additional GHG emissions per year ($MtCO_2e/y$)
World Cup	1.6
Continental competitions: national	1.3
Other national matches	0.2
Global/ continental competitions: club	
Europe only	0.4
Rest of the world	0.5
Total	**4.0**

Notes
Data from sections 3.1 and 3.2.
Club emissions are additional to those discussed in section 2.

3.4 Reducing GHG emissions of international competitions

In section 2.4, we discussed a wide range of options for reducing the GHG emissions of domestic competitions. Many of these also apply to teams playing at an international level so, to avoid repetition, we shall focus in this section on the two dominant emission sources identified in our analysis of international competitions: air transport and new stadium construction.

As we have discussed, flying is an especially polluting form of transport, due to the energy intensity needed to keep a plane in the air. Furthermore, the technological options which could markedly reduce emissions are many years or decades away from realisation at scale – see Box 3.1 – despite some misleading claims from the aviation industry. We have also discussed the flaws in trying to use carbon offsets to deal with this problem in Box 2.4.

Improvements in surface travel – especially the intercity train network – can reduce or eliminate demand for short-haul air travel. Measures implemented as part of World Cup Finals and EURO Finals seem to be helping to increase the use of train travel by fans in host nations during these tournaments.[75] However, there can still be significant obstacles, as occurred in Germany during EURO 2024.[76]

The other main options left – for at least the next decade or more – are:

1. **Reduce the travel distances between matches;**
2. **Reduce the numbers of away fans travelling to any given match; or**
3. **Reduce the number of international matches played.**

The first option could be achieved by more regionalisation of tournaments. For example, the largest region – the Asian zone – could be broken up into two or more parts. Likewise, the qualification phases of competitions could be regionalised. Another option, currently in use by UEFA,[77] for example, is to place restrictions on teams at the extremes of the continent being drawn together during qualification stages. The second option could be enacted by reducing or eliminating minimum ticketing quotas for away fans, such as those required by UEFA. The third option could be put into practice by changing competition formats, and also by abolishing international exhibition matches (such as pre-season friendlies). Some of these options may not immediately be popular among fans but, given the scale of the climate crisis, the huge influence that football can have in shaping social norms, and the fact that flying to watch a football match is a luxury that can be avoided, they should still be seriously explored. Unfortunately, some current trends in international football are going in exactly the wrong direction.

Table 3.10 shows the increase in the number of matches in a selection of high level international tournaments. In addition, UEFA are implementing a similar rise in the number of matches in its Europa League and Europa Conference League. Together, these changes show that, at both club and nation level, and across continental regions, the current practice is to markedly expand the number of matches per tournament – and hence the GHG emissions caused by those tournaments.

This runs against the spirit, if not the letter, of the UN Sports for Climate Action Framework (S4CA). Of the seven international confederations of football listed in Table 3.1, only two have so far signed up to the S4CA – FIFA and UEFA.[78] But even these two bodies are expanding the number of matches per tournament as shown in the table. A key reason is that there is a loophole in the accountability framework. The GHG emissions of tournaments run by a sport governing body are not counted within the official carbon footprint of that body.[79] This means that these bodies are not directly accountable for key decisions related to a sport's emissions. Furthermore, as we have discussed in section 2, it is standard practice for sport governing bodies to rely on carbon offsets to deal with a large fraction of their official emissions and those of the tournaments that they run – and to encourage their member organisations to follow suit.[80] We think these examples encourage a lax attitude to efforts to reduce emissions.

As we discussed in section 2.4.2, bringing the S4CA into line with the more rigorous SBTi would remove the problem of carbon offsets, as their widespread use is disallowed under the latter scheme. However, further specific rules are needed to cover the emissions of sport governing bodies to ensure that they are accountable for increases in club emissions that result from the expansion of competitions that they manage.

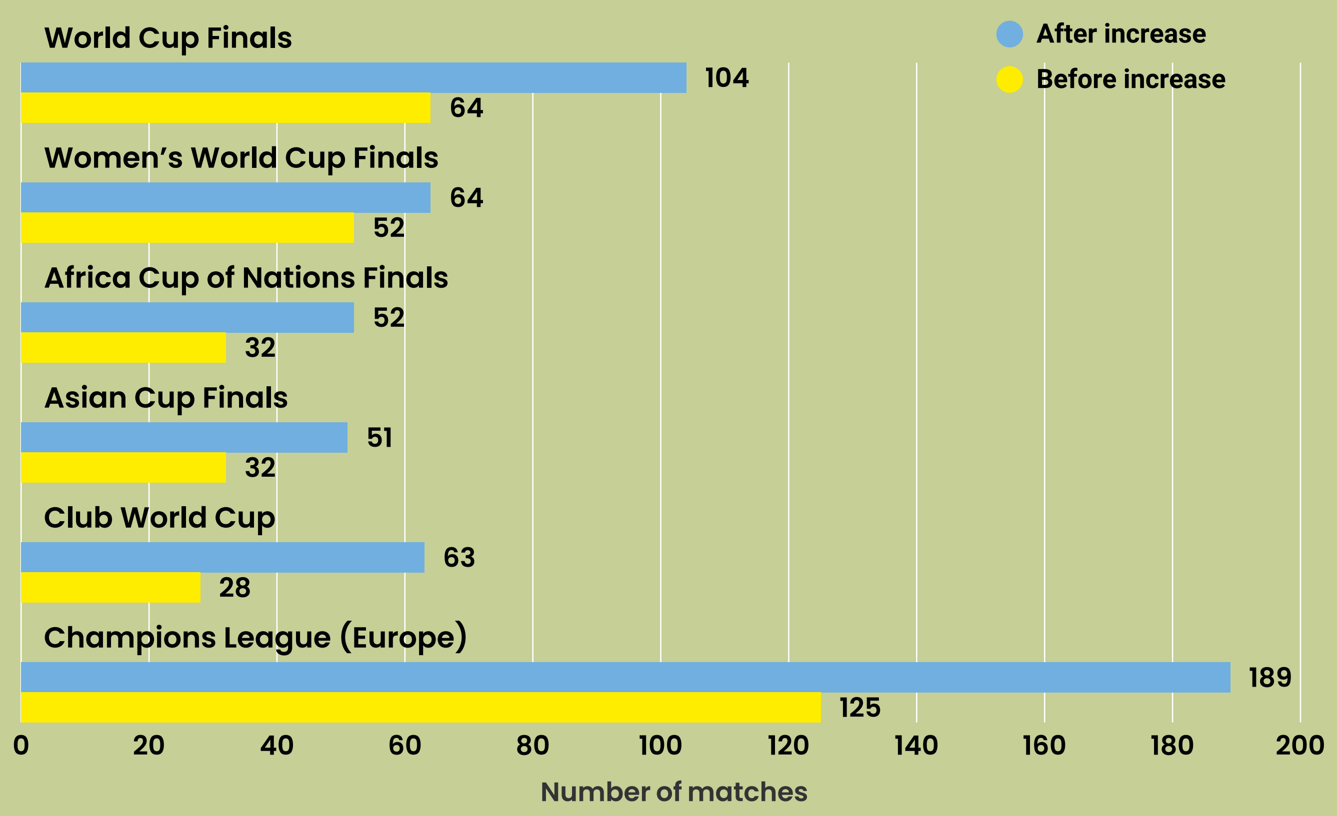
We did identify a small number of positive developments in this area. In 2022, UEFA rejected a proposal to expand the EUROs tournament from 24 to 32 teams, i.e. from 51 to 63 matches.[81] Also, at the 2024 EUROs, the German, Swiss, and Portuguese national teams made a public commitment to reduce their use of air travel during the tournament.[82] Although the actual emissions of team travel are comparatively small compared with spectator emissions, the message these actions send can be influential.

Table 3.10 The increasing number of matches in international football competitions: selected examples since 2018

Tournament	Organising body	Previous number of matches	New number of matches	Percentage increase	Year/ season of change
Nations					
World Cup Finals	FIFA	64	104	63%	2026
Women's World Cup Finals	FIFA	52	64	23%	2023
Africa Cup of Nations Finals	CAF	32	52	63%	2019
Asian Cup Finals	AFC	32	51	59%	2019
Clubs					
Club World Cup (CWC)*	FIFA	28	63	125%	2025
Champions League	UEFA	125	189	51%	2024-25

Notes and references
2018 is when FIFA endorsed the S4CA (see section 2.4.2).
All tournaments are men's except where indicated.
Data from organisational websites, The Guardian (2023b). Op. cit., and the relevant tournament pages on Wikipedia.
* Both the format and frequency of the CWC is changing. Previously an annual competition involving 7 matches, it is scheduled to become a four-yearly event involving 63 – so the figures in the table refer to a four-year period.

Graph 3.3 The increasing number of matches in international football competitions: selected examples since 2018



Box 3.1 Will new technologies lead to green aviation?

As we discussed in Box 2.2, travelling by plane is especially damaging to the climate system. The aviation industry is currently researching a range of technological options to markedly reduce the GHG emissions of this form of transport, but there are major obstacles which mean that, for the foreseeable future, reducing the amount we fly will be the dominant way of tackling these emissions. There are five main technologies which are being investigated, but all have serious drawbacks:[i]

1. **Biofuels;**
2. **Synthetic fuels (also known as e-fuels);**
3. **Electric planes;**
4. **Hydrogen-fuelled planes; and**
5. **Ammonia-fuelled planes.**

Biofuels are the simplest option as they can – and indeed some already are – manufactured to meet the technical standards necessary to be used in an existing, conventional jet engine. However, biofuels manufactured from agricultural feedstocks compete for land with food crops, and so generally exacerbate food shortages. Furthermore, they often fail to reduce net GHG emissions, due to the high lifecycle emissions of growing and refining them. Meanwhile, it is unlikely that biofuels derived from waste oils will substitute for more than about 2% of global aviation fuel consumption.[ii] Hence all biofuel options have major shortcomings.

Synthetic fuels can be created by using electricity from renewable sources to extract carbon from the air and convert it for use in existing jet engines. This option has fewer drawbacks than biofuels, but is still at a very early stage of development as well as having other serious obstacles. For example, a recent study found that the combination of the high energy intensity of flying coupled with the low efficiency of the synthetic fuel production processes could see use of these fuels at scale consume 9% of all global renewable electricity supplies in 2050 – a very high proportion.[iii] Indeed, other research showed that all other major uses of a unit of renewable electricity yielded a larger reduction in GHG emissions than using it for air travel.[iv] These problems led researchers to conclude that, rather than contributing to efforts to tackle climate change, the proposed scale of future production of synthetic fuels for aviation "undermines global goals of limiting warming to 1.5°C".[v]

Electric planes are another technological option. However, they are only likely to be viable for short-haul flights with low numbers of passengers. This is because electric batteries are much too heavy for the limited amount of energy they can store, and major technological improvements are unlikely much before 2050.[vi] Hydrogen is a further option, but again this is limited by physics, this time because the volume required for fuel storage would be very high. Another option is ammonia, but this suffers from similar problems to hydrogen. Furthermore, a switch to either electric, hydrogen, or ammonia planes would require a major redesign of aircraft which would likely take decades to introduce safely at sufficient scale.

The aviation industry claims these technologies hold considerable promise, even labelling options (1) and (2) above as 'Sustainable Aviation Fuels', but this term is misleading. The UK's leading scientific authority, the Royal Society, recently summarised the real situation: "there is no clear or single net zero alternative to jet fuel."[vii]

References

i. Royal Society (2023). Net zero aviation fuels – resource requirements and environmental impacts. https://royalsociety.org/-/media/policy/projects/net-zero-aviation/net-zero-aviation-fuels-policy-briefing.pdf
ii. O'Malley J, Pavlenko N, Searle S (2021). Estimating sustainable aviation fuel feedstock availability to meet growing European Union demand. International Council on Clean Transportation. Working paper, 2021-13. https://theicct.org/sites/default/files/publications/Sustainable-aviation-fuel-feedstock-eu-mar2021.pdf
iii. Becken S, Mackey B, Lee D (2023). Implications of preferential access to land and clean air for sustainable aviation fuels. Science of The Total Environment, vol.886, p.163883. https://www.sciencedirect.com/science/article/pii/S0048969723025044
iv. Climate Change Committee (2020). The Sixth Carbon Budget: Electricity generation. http://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-Electricity-generation.pdf
v. Becken et al (2023). Op. cit.
vi. Royal Society (2023). Op. cit.
vii. Royal Society (2023). Op. cit.

The other key element of international competitions which contributes to GHG emissions is the construction of new stadiums. In 2012, FIFA introduced a requirement that all official men's World Cup stadiums should achieve international sustainable building certification. While this seems to have helped reduce some of the related environmental impacts, including energy consumption,[83] there is a lack of data on whether the GHG emissions for the construction of a new-build stadium has actually fallen. There is also a question as to whether regulations on the minimum sizes of stadiums for high-level international tournaments – e.g. FIFA requires them to have a minimum capacity of 40,000 seats – is compatible with a low-carbon economic pathway for the host nation, which may see limited use of such large stadiums after the tournament has finished. An option that international football confederations have so far been unwilling to contemplate is to allow smaller stadiums to be used, and thus encourage more fans to watch the tournament from their home country – whether this is at home or in a community setting (e.g. 'fan zones' – see section 2.4).[84] This could markedly reduce the emissions of both stadium construction and international air travel.

4. High carbon sponsorship and GHG emissions

The role that sponsorship and other financial deals have in contributing to GHG emissions has been largely overlooked in football – and in sport more generally. One reason is that it's difficult to estimate how much these deals increase emissions – as the effects are indirect and ripple through the wider economy. But these deals do have a significant impact on the behaviour of consumers – if they didn't, sponsors wouldn't spend millions on them. Furthermore, if the sponsors are promoting high carbon pollution sectors, such as fossil fuels or airlines, then the impact on GHG emissions could be large.

Some emerging research is starting to quantify the GHG emissions of sponsorship deals so, in this section, we apply this to several examples in elite football.

4.1 Football sponsorship and high carbon sectors

Football sponsorship is thriving. FIFA reported a total income in 2023 of $1,170 million, of which the largest share was sponsorship – or 'marketing rights' to use the jargon.[85] This sponsorship made up 39% of the total revenue – $456m. Sponsorship is also a major share of income at club level. A financial assessment of the world's top 20 clubs by revenue size found that their 'commercial' income – which included sponsorship – totalled approximately $4,750m[86] in 2022-23 or 42% of total revenue.[87]

Sponsors come from a range of commercial sectors, among them ones with high carbon footprints. We focus on five sectors in this section – fossil fuels; airlines; automotive (car-makers); cruise lines; and animal-based food products (e.g. meat and dairy) – as well as a few closely related businesses. Companies in other sectors may also have large carbon footprints – for example, some financial corporations – so football organisations seeking to avoid such sponsors need to research potential commercial partners carefully.

4.1.1 Sponsorship of clubs

Table 4.1 summarises recent data on the sponsors of leading football clubs in the world. It includes the top 12 clubs by commercial revenue (including sponsorship income) and three other clubs from the top 20. The figures for commercial income have been compiled in the Deloitte Football Money League 2024,[88] with other information from club websites.

The role that sponsorship and other financial deals have in raising GHG emissions has been **largely overlooked** in football

Table 4.1 The world's leading football clubs and their main sponsorship deal

Club	Total commercial income (€m)	No of sponsors	Shirt sponsor	Sponsors in high carbon sectors
Bayern Munich	419	14	Deutsche Telekom	**Audi, Visit Rwanda**
Barcelona	412	32	Spotify	***Cupra**
Real Madrid	403	25	**Emirates**	**Emirates, Visit Dubai**
Paris St Germain	400	14	**Qatar Airways**	**Qatar Airways, Visit Qatar, Visit Rwanda**
Manchester City	399	28	**Etihad Airways**	**Etihad Airways, Nissan, Experience Abu Dhabi, Emirates Palace**
Manchester United	355	28	TeamViewer	**Chevrolet, Malaysia Airlines, Visit Malta**
Liverpool	298	21	Standard Chartered	**Mauritius Now**
Tottenham	261	18	AIA	**INEOS Grenadier**
Chelsea	242	15	Infinite Athlete	**MSC Cruises**
Juventus	218	7	**Jeep**	**Jeep**
Arsenal	195	26	**Emirates**	**Emirates, Sobha, Visit Rwanda, MG**
Borussia Dortmund	188	18	1&1	**Rowe Motor Oil**
Atletico Madrid	122	22	**Riyadh Air**	**Riyadh Air, Hyundai, Rowe Motor Oil**
West Ham United	58	19	Betway	**Eva Air**
Newcastle United	54	12	**Sela**	**Sela, Saudia**

Notes and references
Commercial income is in euros for the season 2022-23 – from: Deloitte (2024a). Op. cit.
Sponsor information is for the season 2023-24 and from club websites.
Shirt sponsors in high carbon sectors are highlighted.
High carbon sectors include: fossil fuels; airlines; automotive; cruise lines; animal-based food products; luxury tourist accommodation; and agencies which explicitly promote these sectors (e.g. tourism agencies specialising in flight bookings or based in distant countries).
*Although Cupra is part of the high carbon automotive sector, it specialises in lower-carbon vehicles, such as battery electric vehicles.

The presence of high carbon sectors among the sponsors of the world's leading clubs is significant. We found 30 of these sponsors among the 15 clubs listed in the table, around 10% of the total number. Of particular concern is that about half the clubs have 'shirt sponsors' – generally the highest revenue-generating form of sponsorship – from these sectors. Airlines and tourism agencies from the Middle East – the world's largest oil-producing region – are especially prominent.

A related problem is the sponsorship of national governing bodies. For example, the Football Association (FA) in England has sold naming rights for its top competition – the FA Cup – to Emirates.[89] Meanwhile, the German Football Association (DFB) lists Lufthansa and Volkswagen among its 'partners'.[90]

Football sponsorship has also encountered criticism for other ethical reasons, for example, the promotion of gambling.

However, the story here is not all bad news. Bayern Munich was the top earner listed in Table 4.1. In summer 2023, it ended its €13m per season sponsorship deal with Qatar Airways following protests by fans over the human rights record of the Qatari government, which owns the airline.[91] Then there's Juventus, which ended its $50m per season shirt sponsorship deal with Jeep in 2024.[92] For the 2024-25 season, its shirts are carrying the logo of the charity, Save the Children.[93] In addition, oil and gas giant, Equinor, announced the end of its sponsorship deal of the Norwegian football federation in late 2024.[94] On restrictions on gambling sponsors, EPL clubs have reached a voluntary agreement which bans "match-day front-of-shirt sponsorship deals" with these companies from the 2026-27 season.[95] While the individual circumstances surrounding such actions are often complex and may not be solely based on ethical criteria, they do demonstrate that even clubs with the highest sponsorship income are able to take climate and other ethical issues into account when making sponsorship decisions. International football governing bodies could play a key role here in facilitating bans of high carbon sponsors among elite clubs – but that would require them to end some of their own sponsorship deals – as we shall examine in the next section.

4.1.2 Sponsorship of international competitions

Sponsorship has also become a major source of income for the organising bodies of football tournaments – not least at the international level. FIFA's World Cup Finals are unsurprisingly the biggest earner, but the six continental confederations can also gain considerable income from this source. Again, the presence of high carbon sectors is striking.

Up until the 2022 World Cup Finals, there were three main levels of sponsorship for FIFA tournaments. These were, in order of importance and income: partners; tournament sponsors; and regional supporters. Other financial deals included kit suppliers and broadcasting partners. From the start of 2023, this changed to four main levels.[96] The highest 'partner' level remained, but the next three levels have separate streams for men's, women's, and e-sport tournaments. We will discuss the significance of this for the women's game in section 5.

Tables 4.2a-b summarise the main sponsors for recent men's World Cups and regional tournaments, highlighting those from high carbon sectors.

Table 4.2a Recent World Cups and sponsors from high carbon sectors

Tournament	No of high-level sponsors	FIFA partners	Sponsors from high carbon sectors	Sponsorship income over 4y cycle ($m)
2018: Russia	20	Adidas, Coca-Cola, Gazprom, Hyundai–Kia, Qatar Airways, Visa, Wanda Group	Gazprom, Hyundai-Kia, Qatar Airways, McDonald's, Mengniu Dairy, Egypt - Experience & Invest	**1,660**
2022: Qatar	32	Adidas, Coca-Cola, Hyundai–Kia, Qatar Airways, Qatar Energy, Visa, Wanda Group	Hyundai-Kia, Qatar Airways, Qatar Energy, McDonald's, Mengniu Dairy, Saudi Tourism Authority, Visit Las Vegas	**1,795**
2026: North America	tba	Adidas, Aramco, Coca-Cola, Hyundai–Kia, Qatar Airways, Visa	Aramco, Hyundai-Kia, Qatar Airways, McDonald's, Mengniu Dairy	**tba**

Notes and references
High-level sponsors include 'FIFA partners', 'World Cup sponsors' and 'Regional sponsors'.
For a list of high carbon sectors, see Table 4.1.
Data from:
FIFA (2018). Financial Report 2018. pp.16-17. https://digitalhub.fifa.com/m/337fab75839abc76/original/xzshsoe2ayttyquuxhq0-pdf.pdf
FIFA (2022b). Annual Report 2022. pp.214-5. https://digitalhub.fifa.com/m/2252cd6dfdadad73/original/FIFA-Annual-Report-2022-Football-Unites-The-World.pdf
Additional information from the relevant tournament pages of Wikipedia.

Table 4.2b Main continental tournaments in 2023-4 and their sponsors from high carbon sectors

Tournament	No of sponsors	Top level sponsors	Sponsors from high carbon sectors
Asian Cup 2023/4: Qatar	12	Continental, Credit Saison, Neom, Qatar Airways, Visit Saudi, Yili Group	Qatar Airways, Visit Saudi, Yili Group
CONCACAF Gold Cup 2023: USA & Canada	17	Allstate, Amazon.com, BMO Harris Bank, Cerveza Modelo de México, Corona, Gatorade, Lay's, MasterCard, Nike, O'Reilly Auto Parts, Qatar Airways, Scotiabank, Six Flags, Ticketmaster, Toyota, Unilever, Valvoline	Qatar Airways, Toyota, Valvoline
African Cup of Nations 2023/4: Ivory Coast	6	Total Energies	Total Energies
EUROs 2024: Germany	19	Adidas, Alibaba Group, Atos, Betano, Booking.com, BYD Auto, Coca-Cola, Engelbert Strauss, Hisense, Lidl, Qatar Airways, Unilever, Visit Qatar, Vivo Mobile	*BYD Auto, Qatar Airways, Visit Qatar
Copa America 2024: USA	16	Absolut Sport, Betano, BYD Auto, Coca-Cola, Delta Air Lines, LATAM Airlines, Decolar/Despegar, Gran Centenario, Inter Rapidísimo, Lowe's, Mastercard, Mercado Livre/Mercado Libre, Michelob ULTRA, Puma, TCL, Unilever	*BYD Auto, Delta Air Lines, LATAM Airlines, Decolar/Despegar
OFC Nation's Cup 2024: Fiji/Vanuatu	1	Lotto Sport Italia	None

Notes
For a list of high carbon sectors, see Table 4.1.
* Although BYD Auto is within the automotive sector, it produces only battery-electric vehicles and plug-in hybrid electric vehicles, so is lower carbon than its peers.
Information from organisational websites and tournament pages of Wikipedia. The identification of sponsors was not always clear in these sources.

The data in these tables again raises serious concerns. Among the sponsors of recent World Cups, 20-30% were from high carbon sectors. For the highest level, FIFA partners, this fraction was close to half, including two of the largest fossil fuel companies in the world: Aramco (based in Saudi Arabia) and Gazprom (based in Russia).

For recent continental tournaments, the proportion of sponsors from high carbon sectors was less – around 15-20% – but it is still very concerning to see another of the world's largest fossil fuel producers, Total Energies (based in France), as the lead sponsor of the Africa Cup of Nations. Indeed, even more disturbing is that, in early 2024, CONCACAF announced a new multi-year sponsorship deal with Aramco.[97] Only the OFC Nations Cup featured no high carbon sponsors in their most recent tournament.

The problem also extends to international club competitions. For example, in September 2024, Qatar Airways became the official airline partner of the UEFA Champions League, in a deal that runs until 2030.[98]

4.2 Estimating GHG emissions of high carbon sponsorship deals

So far, we have focused on the numbers of high carbon sponsors of leading clubs and tournaments. In this section, we use the available data on the monetary size of individual sponsorship deals – which is often obscured by commercial secrecy – and use it to provide some estimates of how these might translate into GHG emissions.

Boxes 4.1, 4.2, and 4.3 summarise the calculations we have carried out to reach our figures.

Box 4.1 Calculating the GHG emissions of a sponsorship deal

The size of the GHG emissions associated with a sponsorship deal – which we label 'E_s' – are affected by four main factors:

- the value of the sponsorship (or investment) deal (V_s);
- the annual revenue (gross) of the sponsoring company (V_c);
- the annual GHG emissions (scopes 1, 2 and 3) of the sponsoring company (E_c); and
- a measure of the financial return that the sponsor expects from the deal (r).

Researchers have used common economic theory and practice to combine these variables into the following equation: [i]

$$E_s = E_c \times V_s / (V_c \times r)$$

The financial return required by the sponsor is in this instance called the Weighted Average Cost of Capital (WACC). It is affected by numerous factors, but is often in the region of 7%,[i] so this is the factor we use in this analysis.

Reference
i. Abrahamsson et al (2024). Dirty Snow: how a ban on polluter sponsorship can help save our snow. New Weather Institute/ Possible/ Rapid Transition Alliance. https://www.badverts.org/latest/polluters-are-melting-the-winter-sports-they-sponsor-now-it-can-be-measured

Box 4.2 Calculating the total GHG emissions of an airline sponsor

As discussed in Box 1.1 and section 2, the standard practice is for companies to report their GHG emissions in three categories: scope 1 (direct emissions); scope 2 (indirect electricity-related emissions); and scope 3 (other indirect emissions).

For aviation organisations, there is a complication as most of the direct GHG emissions from aircraft take place much higher in the atmosphere (in the stratosphere) and so lead to additional heating effects. While there is strong scientific agreement on existence of such effects, their size is subject to greater uncertainty. Hence, the industry has resisted including these in their GHG reporting – despite some criticism.

The most commonly used GHG conversion factors for aviation emissions multiple direct CO_2 emissions by a factor of 1.9.[i] In 2021, new scientific research concluded that "aviation emissions are currently warming the climate at approximately three times the rate of that associated with aviation CO_2 emissions alone".[ii] However, due to the complexities of atmospheric physics, this does not mean that the CO_2 emissions should now simply be multiplied by a factor of 3. In fact, in recommended data sheets, the factor has since been reduced by about 10%.[iii] A further complication is that, if the lifecycle GHG emissions of the extraction of the jet fuel are taken into account, these virtually cancel out the reduction in the factor above.[iv] Hence, using a factor of 1.9 is still essentially the recommended practice – but it now includes lifecycle emissions of fuel extraction. This is the factor we have used throughout this report.

One final point – the upper atmosphere heating effects are most pronounced in the few years after emission, hence the short-term benefits for the climate of reducing air travel now are especially positive when compared with a range of other emissions reduction activity.

References
i. BEIS (2022). Greenhouse gas reporting: conversion factors 2022. September. UK Department for Business, Energy, and Industrial Strategy. https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022
ii. Lee et al (2021). The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018 Atmospheric Environment, vol.244, p.117834. https://doi.org/10.1016/j.atmosenv.2020.117834
iii. DESNZ (2023). Greenhouse gas reporting: conversion factors 2023. July. UK Department for Energy Security and Net Zero. https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023
iv. DESNZ (2023). Op. cit.

Box 4.3 Calculating the total GHG emissions of a fossil fuel company sponsor

Full reporting of scope 3 emissions by a company engaged in the extraction of fossil fuels would mean including the GHGs emitted by the burning of those fuels by end-users. Some fossil fuel companies do not report such emissions which leads to a considerable underestimate of their totals for all three scopes. In cases such as these, we have used figures for annual extraction of fossil fuels (generally called 'production' in company parlance) from their annual reports, converted these into GHG emissions using standard conversion factors,[i] and used these to calculate a revised figure for total emissions.

Reference
i. BEIS (2022). Op. cit.

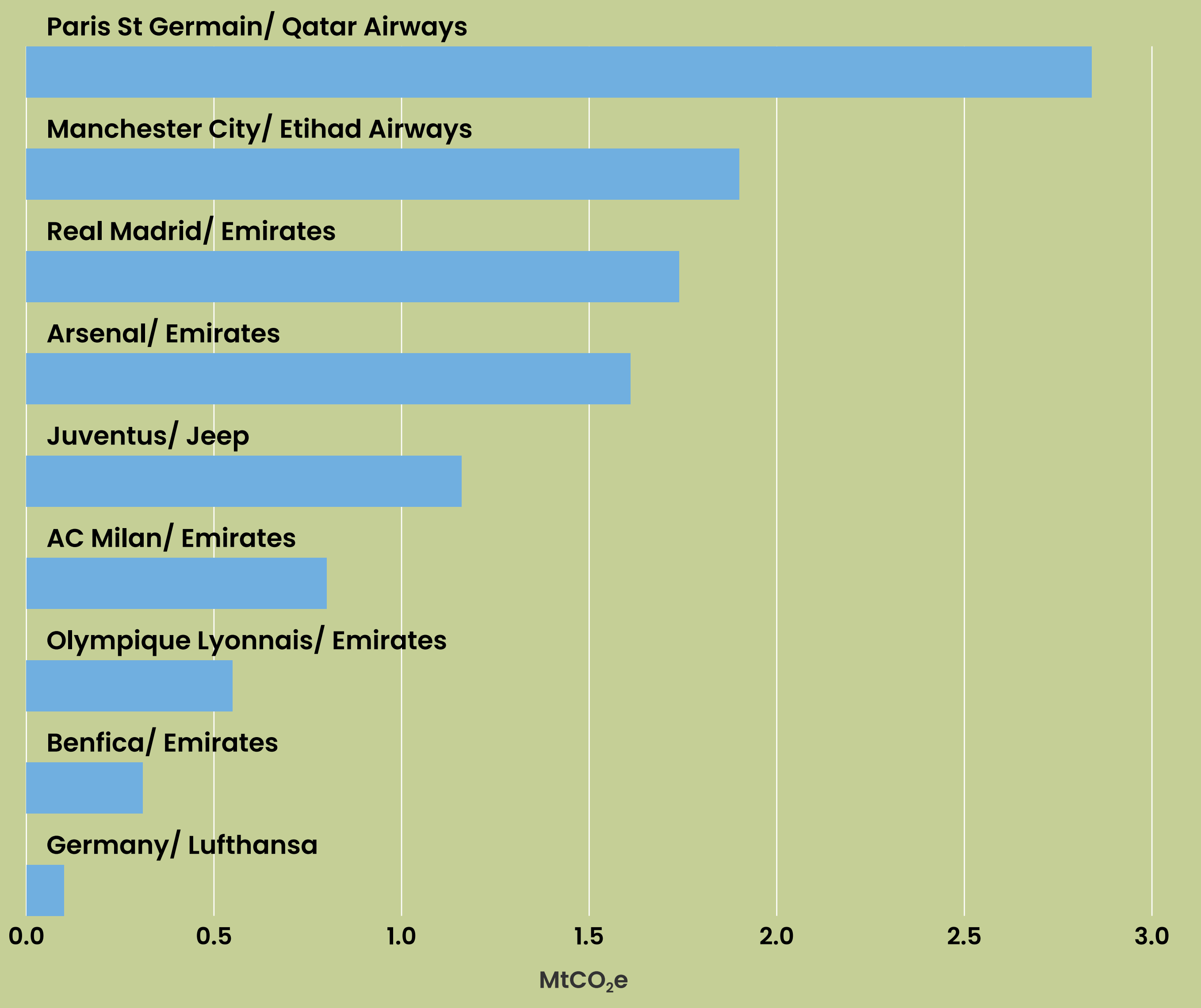
Table 4.3 shows the data related to individual sponsorship deals between teams and high carbon companies in 2023 – mainly between leading European football clubs and airlines. In particular, this table summarises our estimates of how these deals translate into GHG emissions.

Table 4.3 Estimated GHG emissions associated with major sponsorship deals by high carbon companies of elite football clubs for 2023, including source datas

Football team/ sponsor	Estimated sponsorship income ($m)	Company GHG emissions ($MtCO_2e$)	Company revenue ($m)	GHG emissions per unit sponsorship ($kgCO_2e$/$)	GHG emissions of sponsorship (tCO_2e)	Ratio of GHGs from sponsorship to 'typical carbon footprint' of club
Paris St Germain/ Qatar Airways	80	35.2	14,200	36	**2,840,000**	71
Real Madrid/ Emirates	69	51.0	29,000	25	**1,740,000**	43
Manchester City/ Etihad Airways	68	9.7	5,000	28	**1,900,000**	47
Arsenal/ Emirates	64	51.0	29,000	25	**1,610,000**	40
Juventus/ Jeep	46	450.6	192,200	34	**1,160,000**	29
AC Milan/ Emirates	32	51.0	29,000	25	**800,000**	20
Olympique Lyonnais/ Emirates	22	51.0	29,000	25	**550,000**	14
Benfica/ Emirates	13	51.0	29,000	25	**310,000**	8
Germany*/ Lufthansa	4	53.2	30,900	25	**100,000**	-

Notes and references
The values of airline sponsorship deals in 2023 were compiled by market research company, Global Data, and reported in: Airport Technology (2023). Ten of the biggest airline sponsorships in football. 29 November. https://www.airport-technology.com/features/ten-biggest-airline-sponsorships-in-football/
The value of the Jeep sponsorship deal with Juventus was estimated based on data in:
Statista (2020). Annual values of main shirt sponsorship and kit suppliers deals of the Serie A soccer club Juventus FC in 2020. https://www.statista.com/statistics/1136062/shirt-sponsorship-and-kit-deal-values-of-juventus-fc/
Footy Headlines (2024). Juventus Has Not a Single Kit Sponsor for 24-25 Season. 7 February. https://www.footyheadlines.com/2024/02/juventus-has-not-a-single-kit-sponsor.html
Company data on GHG emissions and revenues was gathered from their latest sustainability reports or annual reports at the time of writing – Qatar Airways: 2021-22, scopes 1,2,3; Emirates: 2022-23, scopes 1,2; Etihad Airways: 2022, scope 1; Jeep (Stellantis): 2022, scope 1,2,3; Lufthansa: 2022, scopes 1,2,3. Adjustments were made to airline GHG data as discussed in Box 4.2.
All financial data was converted into US dollars using:
Oanda (2024). Currency converter. https://www.oanda.com/currency-converter/en/
Typical carbon footprint of a tier 1 domestic football club is 40,000tCO_2e as discussed in section 2.2. This figure does not apply to the German national team.*
All figures have been rounded to improve readability – which may lead to very small discrepancies in calculated figures.

Graph 4.1 Estimated GHG emissions associated with major sponsorship deals by high carbon companies of elite football clubs for 2023, including source datas



The sources for the data on the sponsorship deals are given in the notes of the table. The largest deal was the Qatar Airways deal with Paris St Germain at $80m – a considerable sum. The figure for the Etihad Airways deal with Manchester City was lower than some figures reported elsewhere. For example, One Football estimated that the deal was worth £80m ($102m) per year – 50% greater.[99]

Using company-reported data for revenues and GHG emissions, we were able to estimate that – at the lower end of the scale – the German national team's deal with Lufthansa could be responsible for 100,000tCO_2e, while Paris St Germain's deal could be responsible for 2.84 million tCO_2e. The latter figure is about 71 times the typical carbon footprint of a tier 1 club, as calculated in section 2.2. Other ratios are given in the table, and these vary from 8 for Benfica-Emirates to 47 for Manchester City-Etihad. However, if the Manchester City deal is worth the figure reported by One Football, then its sponsorship emissions would be about 2.8 million tCO_2e and the ratio would be 72 – both similar to Paris at the top end of the scale.

It should be understood that reporting for scope 3 emissions by many companies is still under development. In particular, among the data quoted here, scope 3 reporting for Lufthansa and Stellantis (parent company of Jeep) was far more extensive than for Emirates, Etihad Airways, or Qatar Airways. Hence the estimates for sponsorship emissions of these latter three companies should be regarded as especially conservative.

It is striking that, of the nine major sponsorship deals we found and detailed in Table 4.1, eight of them were with airlines. In fact, the extent of airline sponsorship is even greater than implied by this figure. This is because the Juventus-Jeep deal came to an end in summer 2024, while GHG emissions data was not available on a further major deal – Riyadh Air's with Atletico Madrid – which was worth $44m in 2023.[100]

Indeed, the Global Data report, from which much of this data originates, estimated that airline sponsorship across the football sector totalled $521m in 2023, far more than in any other sport. Using an average figure for GHG emissions per unit sponsorship from Table 4.1, this would translate into nearly 15 million tCO_2e. This would be larger than all the scope 1-3 emissions for world's domestic football sector as estimated in section 2.3.

Table 4.4a summarises the available data related to individual sponsorship deals between FIFA and companies from high carbon sectors for the 2022 Qatar World Cup. Table 4.4b repeats this in order to compare the top fossil fuel sponsors for 2018 and 2022 tournaments. Each table summarises our estimates of how these deals translate into GHG emissions in the year in which the tournament took place.

Table 4.4a Estimated GHG emissions associated with major sponsorship deals by high carbon companies of 2022 Qatar World Cup

Sponsor	Sponsor category	Estimated sponsorship spend in 2022 ($m)	Company GHG emissions ($MtCO_2e$)	Company revenue ($bn)	GHG emissions per unit sponsorship ($kgCO_2e/\$$)	GHG emissions of sponsorship (tCO_2e)
Qatar Energy	Partner	119	241.5	53.0	65.1	**7,770,000**
Qatar Airways	Partner	119	35.2	14.2	35.5	**4,230,000**
Hyundai–Kia	Partner	119	108.2	112.6	13.7	**1,640,000**
McDonald's	World Cup Sponsor	68	57.4	23.2	35.4	**2,400,000**
Total (4 companies)		426				**16,050,000**

Notes and references
Data on sponsorship deals estimated from:
FIFA (2022b). Annual Report 2022. pp.214-5. https://digitalhub.fifa.com/m/2252cd6dfdadad73/original/FIFA-Annual-Report-2022-Football-Unites-The-World.pdf
Company data on GHG emissions and revenues was gathered from their 2022 sustainability reports or annual reports. Adjustments were made to the GHG data of Qatar Airways as discussed in Box 4.2 and Qatar Energy as discussed in Box 4.3.
All financial data was converted into US dollars using:
Oanda (2024). Currency converter. https://www.oanda.com/currency-converter/en/
All figures have been rounded to improve readability – which may lead to very small discrepancies in calculated figures.

Graph 4.2 Estimated GHG emissions associated with key sponsorship deals for World Cups, 2018–2022

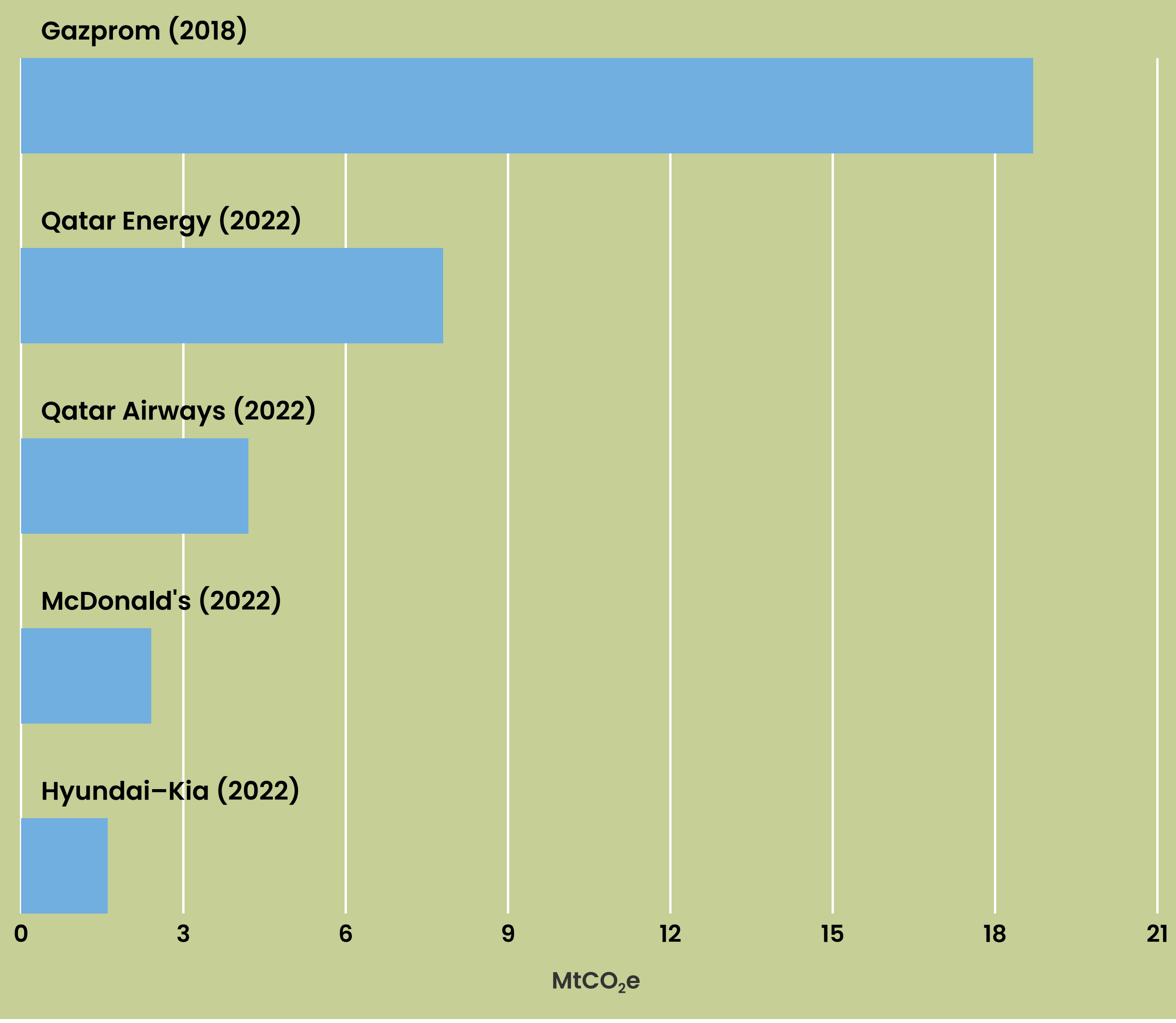


Table 4.4b Estimated GHG emissions associated with top sponsorship deals by fossil fuel companies for World Cups, 2018–2022

Sponsor ('Partner')	World Cup Finals	Estimated sponsorship spend in year of Finals ($m)	Company GHG emissions ($MtCO_2e$)	Company revenue ($bn)	GHG emissions per unit sponsorship ($kgCO_2e/\$$)	GHG emissions of sponsorship (tCO_2e)
Gazprom	2018, Russia	110	1,407	118.5	169.6	**18,650,000**
Qatar Energy	2022, Qatar	119	241	53.0	65.1	**7,770,000**

Notes and references
Data on sponsorship deals estimated from:
FIFA (2018). Financial Report 2018. pp.16-17. https://digitalhub.fifa.com/m/337fab75839abc76/original/xzshsoe2ayttyquuxhq0-pdf.pdf
FIFA (2022b). Op. cit.
Company data on GHG emissions and revenues was gathered from the sustainability reports or annual reports for the relevant year. Adjustments were made to the GHG data as discussed in Box 4.3.
All financial data was converted into US dollars using:
Oanda (2024). Currency converter. https://www.oanda.com/currency-converter/en/
All figures have been rounded to improve readability – which may lead to very small discrepancies in calculated figures.

The size of these figures is striking. The total GHG emissions for the four sponsorship deals of the 2022 Qatar World Cup from high carbon sectors is approximately 16 million tCO_2e. This single year total is more than four times the GHG emissions of the World Cup Finals that year (Table 3.1), larger than the total emissions of the world's domestic clubs that year (section 2.3), and larger than our estimate of the emissions of the aviation sector's sponsorship deals of all football organisations for a single year.

However, even this figure pales in comparison with our estimates for the GHG emissions generated by the sponsorship deals with the top fossil fuel sponsors of the 2018 World Cup. We estimate that Gazprom's sponsorship of the 2018 Russia World Cup led to emissions of nearly 18.7 million tCO_2e. In some ways such huge figures should not be surprising – Gazprom is the world's fourth largest oil and gas company in terms of current and historical CO_2 emissions.[101]

As shown in Table 4.2a, for the 2026 World Cup in North America, FIFA has selected Aramco to become a 'Major Worldwide Partner'.[102] This Saudi Arabian state-owned company is the largest oil and gas corporation in the world.[103] This means that the GHG emissions associated with sponsorship of this tournament are likely to be the highest yet. We will examine the total size of the World Cup sponsorship emissions for the 2023-26 period in a follow-up briefing.

FIFA is not the only international football governing body to hold a sponsorship with a major fossil fuel corporation. CAF currently holds a seven-year deal with Total Energies worth $247m for the African Cup of Nations, while CONCACAF has recently agreed a major multi-year deal with Aramco.[104]

It is no accident that high carbon corporations are using the world's most popular sport to promote themselves and their products.

Overall, the latest data on fossil fuel industry sponsorship of the football sector[105] shows that, in March 2024, there were at least 59 active deals worth a total of about $360m per year, the largest being Aramco's deal with FIFA. If we conservatively assume that the average GHG emissions per dollar of these deals is $100kgCO_2e/\$$ (see Table 4.4b), then the associated emissions would be 36 million tCO_2e.

Bringing together the main figures in this section, and trying to avoid any double-counting, we estimate that the total annual GHG emissions of sponsorship by high carbon sectors is currently in the region of 51 million tCO_2e – but will likely be significantly higher in 2026.

4.3 Prioritising low carbon sponsorship

Some football teams have prioritised low carbon sponsors such as Forest Green Rovers.

As we discussed in Box 2.3, Forest Green Rovers has prioritised sustainability initiatives as part of its club ethos, and this includes its choice of sponsors. Of the 30 listed on its website,[106] none are in high carbon sectors, and many are leading examples of sustainability within their own sectors. For example, the shirt sponsor is Ecotricity, a leading provider of renewable energy in the UK, and others include Oatly and Quorn, which specialise in low-carbon foods, and Candriam, which focuses on ethical investment.

5. Women's football and GHG emissions

Women's football has, until recently, been considerably smaller than the men's game. However, this is changing rapidly.

Perhaps the most striking example of the growth in women's game is the attendance at the 2023 Women's World Cup Finals in Australia and New Zealand. The total for this tournament was just under 2 million – up 75% compared with the previous edition in 2019 – compared to an average of 3.3 million at the last five Men's World Cup Finals.[107] Another example is the average attendance at Arsenal's home matches in the English Women's Super League (WSL) in 2023-24, which reached about 30,000[108] – half of the level of the men's fixtures.

However, by other measures the difference is still very large. For example, the average attendance at *all* WSL matches in 2023-24 was just over 7,000.[109] Hence, this tier 1 competition could only muster crowds typically seen in the men's tier 4 league in that country.[110] Meanwhile, the average annual revenue of the world's top women's clubs was just over €4m in 2022-23[111] – less than 1% of the average of €527m of the world's top men's clubs.[112] Statistics on lower level women's competitions are sparse, but they indicate that it is still a considerably smaller sector globally.

The global GHG emissions of the women's football sector similarly seems to be a very small fraction of the men's – but data is virtually non-existent. An assessment of the emissions of the 2023 World Cup Finals[113] excludes fan travel and accommodation, and therefore excludes around 95% of the emissions, just as the first study of the men's World Cup in Germany, 2006, did. FIFA also used discredited 'offsets' for the under-reported 70,000tCO_2, without any mention of actions to try to reduce these emissions – despite the high attendance figures and the likely high levels of air travel due to the host nations being far from the main centres of women's football in Europe and the Americas, and the long travel distances between the stadiums.

Regarding sponsorship of the sport, it is again instructive to look at the case of the World Cup Finals. The tournament had 30 sponsors, four of which were from high carbon sectors: Hyundai-Kia, Mengniu Dairy, McDonald's, and Qatar Airways.[114] This was a lower proportion than the men's tournament, and it was especially encouraging that Qatar Energy – a major fossil fuel company that was a leading sponsor of the 2022 Men's World Cup – was not among them. However, the deals with the other four high carbon sponsors could still be responsible for significant emissions. Our estimates for the GHG emissions of sponsorship deals in section 4 included at least some of the funding for women's tournaments, so we do not provide a separate estimate in this section.

There does, however, seem to be growing awareness of the importance of the climate crisis among professional women players. For example, a group of 44 leading players at the 2023 World Cup Finals announced that they would donate money to "climate resilience and carbon offsetting initiatives" to cover the carbon footprint of their flights to the tournament.[115] (While important, as we have discussed, such initiatives should not be seen as a replacement for action to actually reduce emissions.) Also, in October 2024, more than 100 professional women's footballers signed an open letter urging FIFA to drop Aramco as a World Cup sponsor.[116]

Women's football has also been a high profile advocate of human rights. For example, FIFA carried out 'Football Unites the World' advocacy at the 2023 World Cup,[117] which promoted issues such as gender equality, inclusion for minority groups, support for indigenous peoples and refugees, and campaigns to end violence against women and end hunger. However, FIFA was also accused of hypocrisy by both players and human rights groups when, in parallel with this advocacy, it tried to negotiate a sponsorship deal for the tournament with the travel agency Visit Saudi, given the poor human rights record of that nation.[118] In the end, the deal was abandoned. This also highlights a desire among the game's stakeholders to go beyond the official positions of the sport's governing bodies.

Further support for climate action – especially among players and fans – would seem to follow naturally from efforts on human rights. However, without a significant increase in effort by clubs and governing bodies, the rapid growth of the women's game – especially at an international level – threatens an increase in GHG emissions which would undermine such initiatives.

6. GHG emissions of the global football sector

In this section, we bring together all our estimates of the GHG emissions of different parts of the football sector, together with some additional analysis using data from mathematical modelling of environmental-economic systems. This will enable us to provide an estimate of the total carbon footprint of the global football sector. It will also reveal the key areas where emissions reduction action should be focused to achieve major cuts.

First, we add up all the main sources of emissions derived from conventional carbon footprint analysis – as defined by the GHG Protocol (see section 1). These were outlined in sections 2.3 and 3.3, and Table 6.1 summarises the key figures. This is known as a 'bottom-up' approach.

The table shows that the global GHG emissions from the main activities of the football sector have recently been approximately **15 million tCO_2e per year**, but they are rising mainly due to increases in air transport by fans travelling to international matches. This total is similar to the total GHG emissions of a country like Latvia or Costa Rica.[119] Lower domestic leagues – with annual attendances below one million – are responsible for less than 7% of the total.

An alternative way of estimating these emissions is to use a form of environmental-economic analysis, known as 'environmentally-extended multi-regional input-output modelling'. This is known as a 'top-down' approach, and was developed by researchers at Lancaster University in the UK and a spin-out environmental company called Small World Consulting (SWC).[120] The approach generates GHG conversion factors – in tCO_2e per unit currency – for whole economic sectors. So, if we have figures for the revenues of an economic sector, we can use these factors to estimate its total GHG emissions. The mathematical model used by SWC has two limitations when we think about applying it to the global football sector. Firstly, it is UK-focused, but it does include international data and currency conversion, so some extension to the international situation can be made. Secondly, the smallest relevant economic sector that it models is 'sport, amusement, and recreation activities', much broader than football. Nevertheless, it can still be used to generate a first approximation for the global football sector.

The key data for this analysis is shown in Table 6.2, together with references. The global GHG conversion factor is estimated based on a weighted average of the country-level conversion factors from the SWC model for the nations home to the world's top 10 leagues by revenue in 2022. This analysis gives a figure for the global GHG emissions of just over 13 million tCO_2e per year. This is a little smaller than the estimate from Table 6.1. However, given the simplifications in the modelling analysis discussed above, the difference is not that large. The lower estimate in the top-down analysis could be explained by, for example, an inability of the model to adequately factor in the large influence of air transport emissions – including upper atmosphere effects (see Box 4.2) – in the elite football sector.

Table 6.1 Bottom-up assessment of global GHG emissions of football sector by main source (up to 2023-24)

Emission source	GHG emissions (MtCO_2e/y)
Domestic competitions:	
• scopes 1+2; spectator surface travel; stadium construction; other sources	
• elite	9.0
• lower tier	1.0
• air transport (elite)	1.0
International competitions:	
• national teams	3.1
• clubs (air transport only)	0.9
Total	**15.0**

Notes
Figures for domestic football competitions from section 2.3. Figures for international competitions from Table 3.10.

Neither analysis, however, adequately accounts for sponsorship-related GHG emissions – especially the degree to which the football sector has financially linked itself to promoting high carbon sectors. This we analysed in section 4.2, with our main estimates summarised in Table 6.3. We reiterate that this analysis does not include all high carbon sponsors.

The total figure is 51 million tCO_2e per year – more than double our estimates for the main activities of the global football sector. Although this is a comparatively new area of analysis, and the uncertainties are significantly larger, the estimate demonstrates just how important it is to reduce and eliminate high carbon sponsorship in the sport.

We bring these figures together in Table 6.4 to estimate that the total carbon footprint of the global football sector is 64-66 million tCO_2e per year. This is similar to the GHG emissions of a nation such as Austria or Bahrain.[121] Over 75% of this total is due to high carbon sponsorship. Again, we point out that our estimate is based on several conservative assumptions.

Table 6.2 Top-down assessment of global GHG emissions for football sector, 2022

Global revenues of football sector ($ bn)	GHG conversion factor ($kgCO_2e/\$$)	GHG emissions ($MtCO_2e$)
47.0	0.279	13.1

Notes
Rome Business School (2022). The Business of Sports in Italy/ Football is the most profitable sport, with global revenue of $47 billion. November. https://romebusinessschool.com/research-center/football-is-the-most-profitable-sport-with-global-revenue-of-47-billion/
SWC (2023). Multi-Regional Input Output data. September. https://www.sw-consulting.co.uk/mrio
Wikipedia (2024f). List of professional sports leagues by revenue. https://en.wikipedia.org/wiki/List_of_professional_sports_leagues_by_revenue

Table 6.3 Global GHG emissions of key football sponsorship deals with high carbon sectors

High carbon sector	GHG emissions ($MtCO_2e/y$)
Fossil fuels	36
Airlines	15
Total	**51**

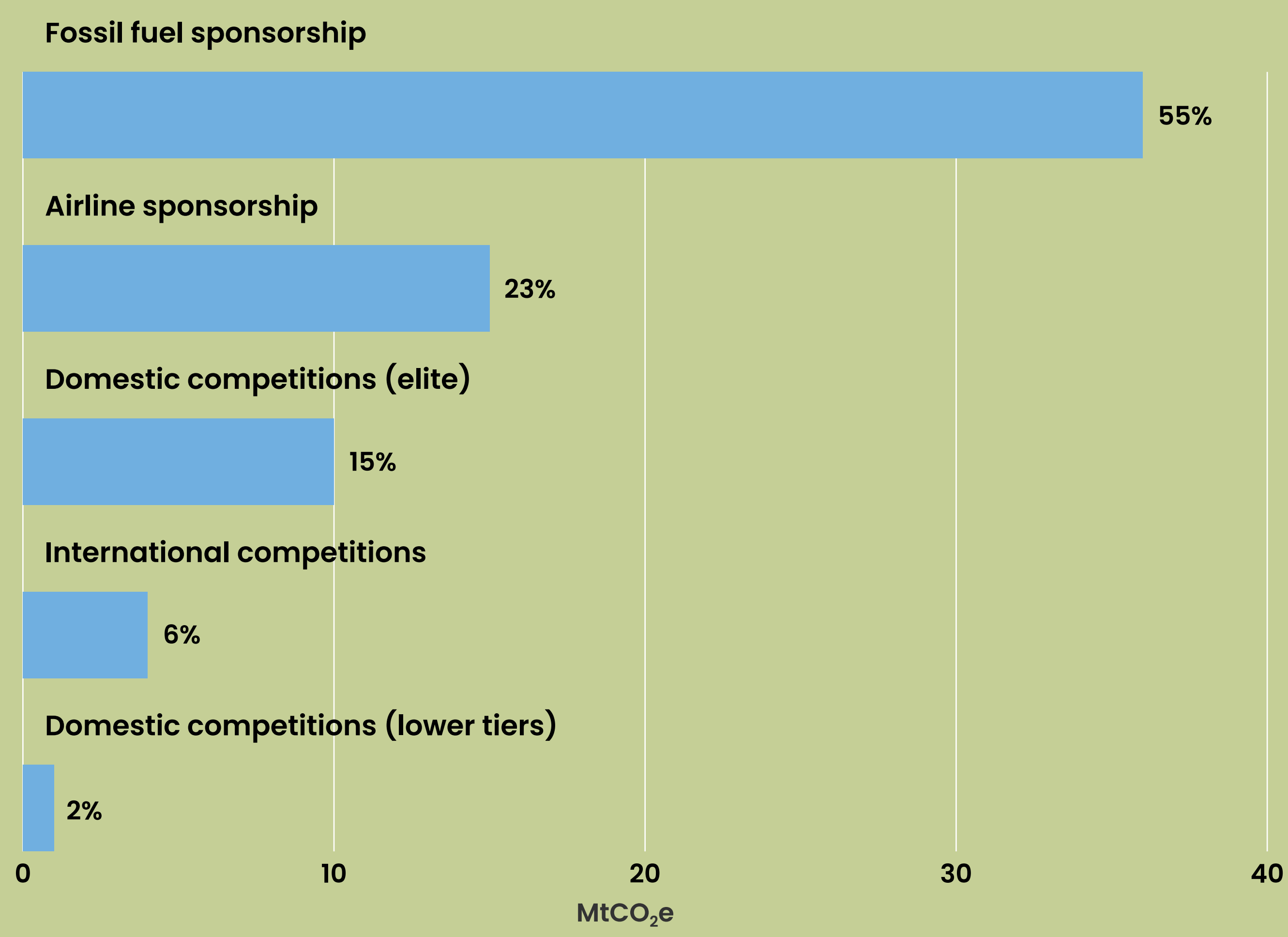
Notes
Data from section 4.2.

Table 6.4 Estimated total carbon footprint for the global football sector

Source	GHG emissions ($MtCO_2e/y$)
Main footballing activities	13-15
Sponsorship deals with high carbon sectors	51
Total	**64-66**

Notes
Data from Tables 6.1-6.3. All figures are rounded.

Graph 6.1 Global carbon footprint of football: key components



Note
Data from Tables 6.1 and 6.3.

From these figures, it is easy to see that a rapid move away from high carbon sponsorship would yield the largest emission reductions. Moving sponsorship to sectors and businesses with very low carbon emissions could reduce football's carbon footprint by around 75%. Further action – of the sort discussed in sections 2.4 and 3.4 – could bring emissions down further, to at least 80%, and with ambitious action this could reach 90%.

As we highlighted in section 1, the window for action to avoid breaching the Paris target of 1.5°C has almost closed. A 'fair shares' approach would see organisations based in industrialised nations reducing their carbon footprint by about 90% by 2030. For most sectors, this would be extremely challenging, but for football – according to our analysis – the potential for success is significantly greater.

7. Conclusions and Recommendations

Football has a huge global following. The top 56 leagues in the world record in-person attendances of over 220 million per season,[122] with TV audiences often an order of magnitude greater. FIFA estimated that 5 billion people "engaged" with the 2022 men's World Cup Finals tournament[123] – which is over 60% of the world's population. This following of the sport translates into a huge influence on human society. If the football sector – its governing bodies, its teams, and its players – treat the threat of climate change seriously, then this could have a major effect on the attitudes of sports-fans and society as a whole.

Our report has shown that, while there are positive words from some senior officials and a growing number of initiatives to measure and reduce GHG emissions, they are deeply undermined by several negative trends, the three most critical being: sponsorship deals with high carbon pollution sectors, including fossil fuel corporations and airlines; an expansion in the number of international matches, which is contributing to increases in air travel; and the widespread use of controversial carbon offsets. In general, there is a lack of urgency in climate-related efforts – with even schemes to measure emissions still at an early stage or non-existent.

On current projections, the Paris target to keep global temperature rise below 1.5°C will be breached by 2031. Yet our research indicates that the football sector is not even close to doing its fair share to prevent this. Action needs to be rapidly increased. The good news, however, is that there is a range of feasible actions which could bring very large reductions. Chief among them would be to end high carbon sponsorship deals.

In more detail, the main findings of this report are as follows.

- We estimate the total carbon footprint for the global football sector is 64-66 million tCO_2e per year, equivalent to the annual GHG emissions of a nation such as Austria. Over 75% of this is due to sponsorship deals with high carbon companies. These deals help to stimulate an expansion of polluting activities – much in the same way as tobacco sponsorship of sport in the past encouraged smoking. To our knowledge, this is the first time an estimate has been made for the size of the total emissions due to this sector.
- Sponsorship deals between elite football and the oil and gas industry and airlines are especially large in financial terms. The biggest deals currently in operation include FIFA and CONCACAF partnerships with Aramco, the world's largest oil and gas corporation, and leading European club partnerships with airlines, such as Emirates, Etihad Airways, and Qatar Airways. It is no coincidence that these sponsors are mainly based in the oil-rich regions of the world. Specifically, we estimate that:
  - four major sponsorship deals of the men's World Cup Finals in 2022 were together responsible for GHG emissions of more than 16 million tCO_2e;
  - the four largest sponsorship deals between European clubs and airlines in 2023 were together responsible for GHG emissions of more than 8 million tCO_2e. The four clubs involved were Paris St Germain, Real Madrid, Manchester City, and Arsenal.
- We estimate that the global carbon footprint of football's non-sponsorship activities to be 13-15 million tCO_2e per year, equivalent to the GHG emissions of a nation such as Costa Rica.
  - The activities which contribute most to this total are spectator travel to matches and the construction of new stadiums. Air transport and car transport are particularly problematic. We have found clear evidence that the expansion of international football tournaments, and the increase in air travel that they cause, are increasing emissions.
  - Other main activities included in this total are the production and sale of merchandise, energy use and catering at stadiums, and team and employee travel.
  - Over 93% of these emissions are due to the activities of elite domestic leagues – with annual attendances above one million – and international tournaments.
- We estimate that the GHG emissions per match in a men's elite domestic club competition – such as the English Premier League – are about 1,700tCO_2e, with travel-related emissions being about half of this total. The total rises by about 50% for a match in an international club competition, mainly due to air travel by spectators. One match at a men's World Cup Finals is responsible for between 44,000tCO_2e and 72,000tCO_2e – between 26 times and 42 times that for a domestic elite game. The emissions of the World Cup match is equivalent to between 31,500 and 51,500 average UK cars driven for a whole year. These figures do not include high carbon sponsorship-related

emissions – which we estimate, on average, increases total emissions per match by over 350%.

- We estimate that the men's World Cup – including finals and qualification – has in recent years been responsible for 6.5 million tCO_2e over its four-year cycle – with most emissions concentrated during the finals. We further estimate that other international men's competitions and matches – including the EUROs, Copa America and others – are collectively responsible for an average of 1.5 million tCO_2e per year. The expansion of the World Cup Finals from 32 to 48 teams – from 2026 onwards – will likely lead to a major increase in GHG emissions.

- GHG emissions from women's football represent a very small fraction of those of the men's game, but are likely to be rising quickly with the current expansion of the sport.

- Data on football-related GHG emissions are in general of low quality and sometimes even non-existent, even at elite levels. Data collection is at an early stage of development in most cases. For example:

  - In club level data from the English Premier League and the German Bundesliga, we found that all the highest estimates in the main emissions categories were at least 10 times the lowest estimates. Hence, we had to make many simplifying assumptions and extrapolations to produce our average estimates, and we were intentionally conservative in doing so. This poor quality of data is particularly disturbing as the English and German leagues are seen as world leaders on climate action.

  - At international level, we could find no official estimates of the emissions of World Cup qualification phases, or for the finals or qualification stages of the regional tournaments run by five of the world's six football confederations – in Africa, Asia, North America, South America, and Oceania. Hence, we were only able to produce first estimates with high uncertainties for these competitions.

  - Further effort to improve data quality is urgently needed and football's governing bodies should make this a priority going forward.

- Efforts to address the GHG emissions of football are still in their early stages, despite the importance of the climate crisis.

  - There is very little acknowledgement by clubs or football associations of the damage caused by sponsorship deals with high carbon pollution companies.

  - Attempts to measure the carbon footprints of elite clubs, football tournaments, and governing bodies often do little more than focus on 'scope 1' and 'scope 2' emissions – a small fraction of the total.

  - Even when more comprehensive GHG assessments are carried out – for example, at the men's World Cup Finals – there are still significant shortcomings.

  - Action is being undermined by the expansion of elite international tournaments, such as the men's World Cup Finals and the men's Champions League in Europe.

  - Efforts to reduce emissions, where they do exist, are often limited or sidelined by a focus on carbon offsets, an approach strongly criticised by both climate scientists and regulators. The potential emissions associated with high carbon sponsorship deals are ignored.

- However, there are some glimmers of hope.

  - Leading women footballers have called for an end to Aramco's sponsorship deal with FIFA, and Bayern Munich dropped Qatar Airways as a shirt sponsor following fan protests over human rights concerns, showing what is possible.

  - Initiatives such as Pledgeball and Planet League are having some success encouraging football fans to adopt low carbon behaviours through club-based competitions, while other groups like the Cool Down Network and multiple football-focused climate campaigners are making the issue a permanent feature of commentary on the game.

  - The UN Sports for Climate Action Framework (S4CA) is just starting to encourage emissions reduction action among some elite clubs and football associations.

  - Some measures to improve surface public transport and increase its usage by fans have become a significant element in the staging of some international football tournaments – especially at World Cups and the EUROs.

  - A few clubs like England's Forest Green Rovers are pioneering low-carbon action.

Our main recommendations are:

- Estimates of the GHG emissions of football clubs, associations, and tournaments should include an assessment of the additional 'sponsored emissions' resulting from sponsorship deals using methodologies like the one applied in the report. Elite clubs and top governing bodies should take the lead in this activity.

- There should be a rapid phase-out of all football sponsorship deals with high carbon, heavily polluting corporations. Ending deals with fossil fuel companies, airlines and SUV makers should be a particular priority. FIFA, the six continental confederations, and elite clubs must take a leadership role. A rapid phase-out plan should be a condition for team entry to elite competitions. New deals with low carbon companies should rapidly become the norm.

- Further expansion of international football tournaments in the men's and women's game should be halted and reversed. This will reduce GHG emissions from air travel and new stadium construction, as well as benefit player welfare. Smaller, more regional tournaments should be the norm. These can be complemented by initiatives to encourage sustainable transport.

- Ticket sales for international tournaments should focus on local fans. This would make it more exciting for people to see an international tournament coming to town, as well as markedly reducing emissions.

- The S4CA should be strengthened, with added science-based targets and timeframes for action, drawing on expertise from schemes such as the Science-Based Targets initiative (SBTi). In particular, the widespread and poorly regulated use of carbon offsets – as currently practiced by many football organisations, and allowed for by the S4CA – should be immediately ended.

- All football governing bodies and elite clubs should sign up to the S4CA, and this should be made a condition for entry into elite competitions. Pending the improvements discussed above, S4CA signatories should not use carbon offsets for meeting their 2030 emissions targets.

- Action in and around the stadium should be taken, including the increased use of solar photovoltaic panels, LED floodlights, electric heat pumps, electric vehicles, and plant-based food, together with a reduction in the amount of new football shirts and other merchandise. However, as this report makes clear, the most important areas for climate action in football are high carbon sponsors and the sporting calendar.

- The scheduling of games should be aligned to enable maximum, easy use of public transport by fans, and financial incentives on ticket price to encourage travelling by low carbon, mass-transit.

- While carbon offsets should not be counted towards GHG emission targets as discussed above, football bodies should still fund climate-related projects in their community or region. Clubs should also vigorously promote fan participation in initiatives such as Pledgeball and Planet League, which could contribute to much-needed environmental behaviour change in wider society.

- Players should have freedom of speech to talk publicly about their environmental concerns and take a leadership role, to use their platforms to speak out on climate threats and be able to criticise polluting sponsors without fear of censure.

Some might argue that the controls we suggest – especially on sponsoring companies – might reduce football revenues to the detriment of the sport. We think it more likely that the reverse would be the case. For example, at the moment, a small number of high carbon sponsors – generally Middle Eastern airlines – are having a powerful effect on several of Europe's top clubs, which are winning a large fraction of national and international tournaments. Hence, the competitiveness of these tournaments may actually be improved by excluding this financing.

In summary, as the climate crisis rapidly worsens, it is time for the football sector to step up and take responsibility, both for its contribution to the problem, and for the opportunity to galvanise global action to help lessen the impacts.

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Cool Down is a network that believes sport and the climate emergency are inseparable. Its members campaign to raise awareness, challenge those polluting sport, and help lead the way on rapid transition. It was initiated by the New Weather Institute and the Rapid Transition Alliance.

cooldownclimate.org

Badvertising

'Badvertising' is a campaign to stop adverts and sponsorships fuelling the climate emergency. This includes, amongst others, ads and sponsorships for cars, airline flights and fossil fuels.

badverts.org

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All views (and any errors) remain the responsibility of the authors.

Appendices

A1. Calculating the number of matches in a competition

The number of matches played in a football 'league' competition, where all teams play each other twice (i.e. home and way legs) can be calculated by the following equation:

$M_t = N_l \times (N-1) \times (N/N_m)$

M_t – total number of matches

N – number of teams in league

N_l – number of legs between each team, i.e. two

N_m – number of teams playing in a single match, i.e. two

This equation can thus be simplified to:

$M_t = N \times (N-1)$

The number of matches played in a football 'cup' competition, i.e. standard knock-out, where each team only progresses to the next round if it wins, can be calculated using the following equation:

$M_t = N-1$

M_t – total number of matches

N – number of teams in league

Thus a league competition will always involve considerably more games than a cup competition for the same number of teams entering.

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