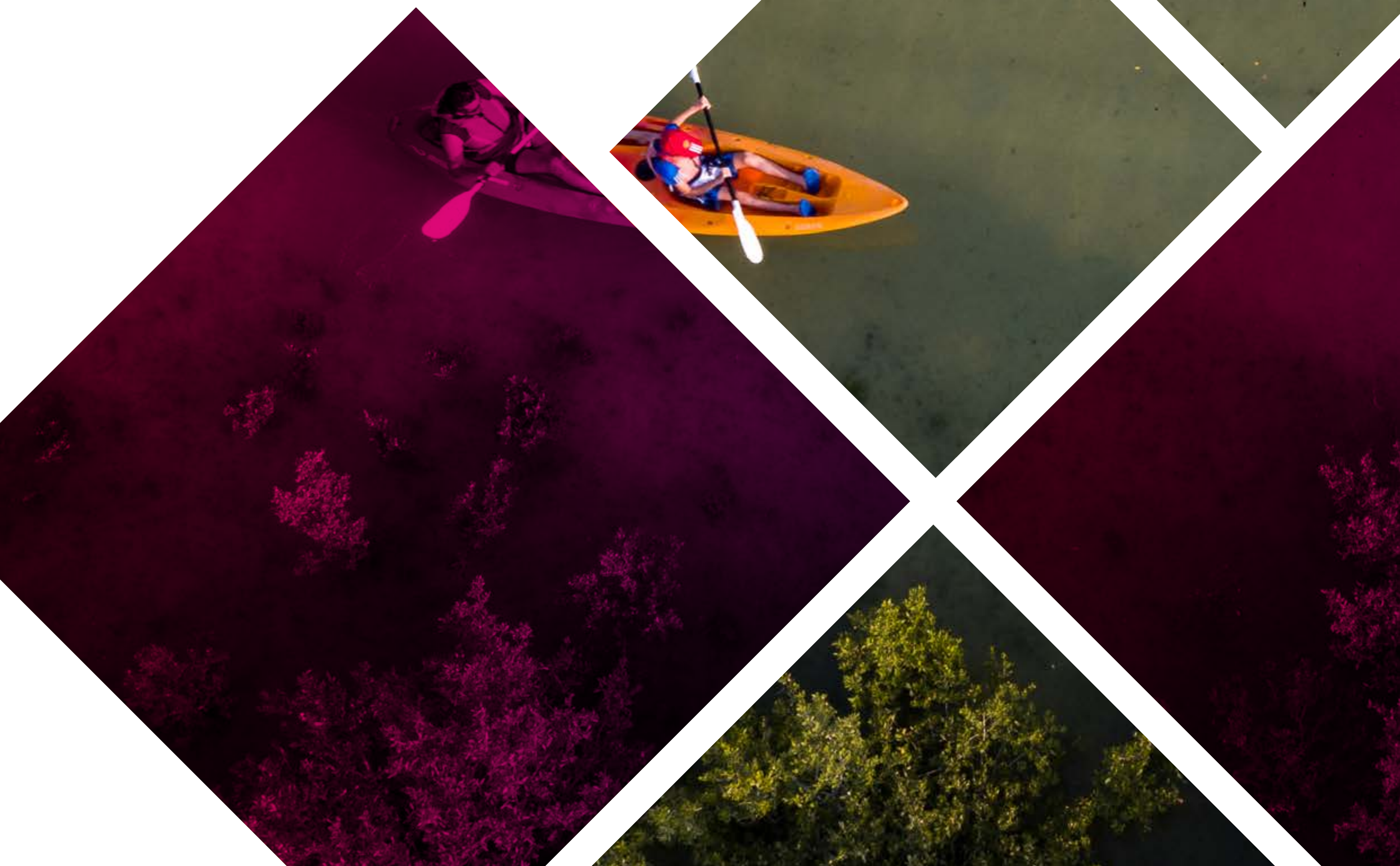
FIFA WORLD CUP Qatar2022

Greenhouse gas accounting report

FIFA World Cup 2022™



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Cover page image: Kayakers at Al Dhakhira Mangroves, Qatar © SC

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Acronyms and abbreviations

BEIS	United Kingdom Department for Business, Energy and Industrial Strategy
CHSB	Cornell Hotel Sustainability Benchmarking
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
EPD	Environmental Product Declaration
FIFA	Fédération Internationale de Football Association
FCWC	FIFA Club World Cup™
FWC	FIFA World Cup™
GHG	greenhouse gas
GRI	Global Reporting Initiative
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram
N_2O	nitrous oxide
PMA	Participating Member Association
Q22	FIFA World Cup Qatar 2022 LLC
SF_6	sulphur hexafluoride
SC	Supreme Committee for Delivery & Legacy
t	tonne
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute

Executive Summary

Executive summary

The FIFA World Cup™ (FWC) is an international football competition for the senior men's national teams of FIFA's member associations which crowns the world champions every four years.

The next FIFA World Cup will take place in Qatar from 21 November to 18 December 2022. Qatar is the first Middle Eastern nation and also the smallest country to host a FIFA World Cup. All stadiums will be within 50km of the centre of Qatar's capital city, Doha, keeping travel between matches to a minimum.

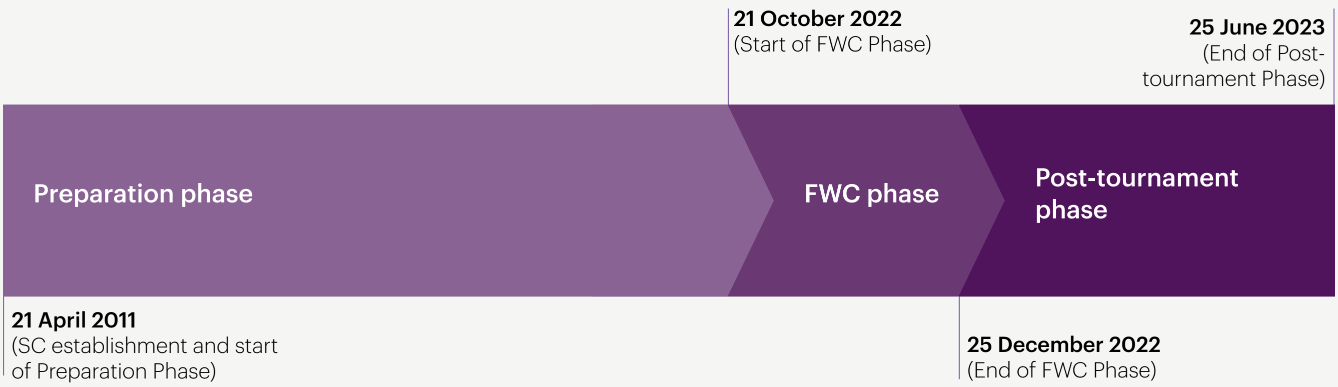
Among many other activities, staging the tournament entails the construction and renovation of relevant infrastructure, transporting thousands of people to the matches and Fan Fests, the provision of accommodation, managing waste in the stadiums and broadcasting fixtures in over 200 countries. This scale inevitably has an impact on the climate, yet conscientious sustainability efforts can mitigate its impact.

As the three organisers of this mega event, FIFA, the FIFA World Cup Qatar 2022 LLC (Q22), and the Supreme Committee for Delivery & Legacy (SC) are committed to protecting and conserving the environment. As part of their joint FIFA World Cup Qatar 2022™ Sustainability Strategy, they have pledged to measure, mitigate and offset all FIFA World Cup 2022 greenhouse gas (GHG) emissions, while advancing low-carbon solutions in Qatar and the region. As a first step, it is important to understand the emissions related to the preparation, staging and post-event activities of the FIFA World Cup. For this reason, FIFA, Q22 and the SC have conducted an analysis of the projected GHG emissions resulting from the FIFA World Cup 2022 with the support of subject-matter experts.

The GHG accounting and reporting procedure used for this report is based on the Greenhouse Gas Protocol, the most widely used international accounting tool for government and business leaders to understand, quantify and manage greenhouse gas emissions. The system boundaries follow the operational-control approach.

The reporting period includes tournament-related activities under the control of the organisers between April 2011 and June 2023. It is divided into three phases:

Figure 1: Overview of the reporting period



The data inventory process focuses on collecting data for emission sources for activities with the potentially largest emissions during the reporting period. Data includes both actual activity data from the preparation phase and estimated data for 2019 to 2023. Where data is lacking, estimations and extrapolations are made based on statistics and available data, for instance from past FIFA carbon footprint reports and design documentation for FIFA World Cup 2022 stadiums. The choice of assumptions and emission factors followed a conservative approach. Emission factors were derived from international databases, such as Ecoinvent (version 3.1), the Department for Business, Energy & Industrial Strategy (BEIS) (2016) and the International Energy Agency (IEA) (2019).

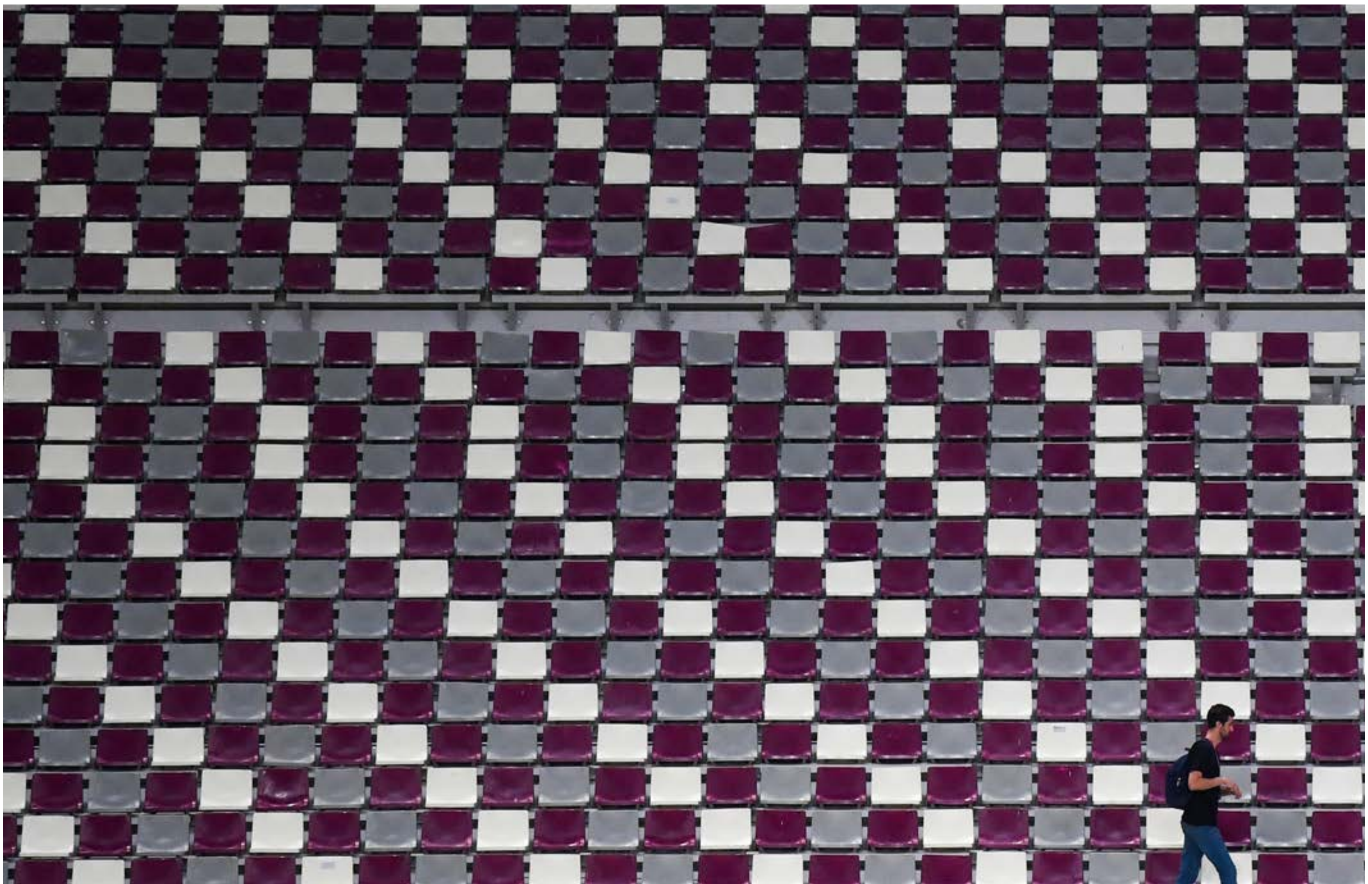
The total GHG emissions for all three reporting periods are estimated to be 3,631,034 tonnes of carbon dioxide equivalent (tCO_2e). The majority (95%) are indirect emissions (Scope 3), mainly from travel (1,878,106 tCO_2e, or 51.7%) and accommodation (728,403 tCO_2e, or 20.1%) for match attendees in Qatar, including the general public, officials and staff. It is estimated that 75% of total emissions (2,712,178 tCO_2e) are produced during the FWC phase, with 44% (1,763,038 tCO_2e) emanating from the international air travel of attendees during the FWC phase. Of these, 78.6% (1,385,748 tCO_2e) stems from the general public travelling to FWC matches. The third-largest source of estimated emissions is from infrastructure construction and operation (893,337 tCO_2e, or 24.6%), including the construction of stadiums, training sites and temporary facilities. These three largest categories represent over 96% of total emissions, or 52% for travel, 20% for accommodation and 24.6% for infrastructure construction and operation.

Figure 2: FIFA World Cup 2022 total GHG emissions per scope and main emission sources for each scope

Total (100%) 3,631,034 tCO_2e	
Scope 3 (98%) 3,558,715 tCO_2e	Other (4%) 58,868 tCO_2e
	Accommodation (20.1%) 728,403 tCO_2e
	Infrastructure construction & operation (24.2%) 893,337 tCO_2e
	Travel (51.7%) 1,878,106 tCO_2e
Scope 2 (1%) 37,216 tCO_2e	Other (0.1%) 2,291 tCO_2e
	Electricity (0.9%) 34,925 tCO_2e
Scope 1 (1%) 35,103 tCO_2e	Other (0.1%) 1,858 tCO_2e
	Stationary combustion (0.9%) 33,245 tCO_2e

Infrastructure emissions include permanent venues, temporary infrastructure within these venues and temporary facilities. For the FWC 2022, seven new stadiums are being built in Qatar and a further stadium is being refurbished. They have been planned and designed for long-term use with legacy plans that will provide space not only for sport events and activities, but also for other non-sporting facilities once the tournament is over. The estimated life-cycle emissions are allocated to the FWC 2022 emission inventory based on the stadiums' operational period of 46 days for the tournament plus 12 days each for the FIFA Club World Cup™ in 2019 and 2020 (4,541 tCO_2e). The temporary infrastructure of the stadiums (640,058 tCO_2e) built specifically to accommodate the tournament-seating requirements has been allocated to the emission inventory. This includes the full emissions for the materials, construction and demounting of the temporary Ras Abu Aboud Stadium, which is being purpose-built for the tournament and will be dismantled after the event. In addition, over 170,000 temporary seats and supporting structures have been fully allocated to the FWC 2022 emission inventory.

It is important to note that each FIFA World Cup is unique in its context, organisation and delivery. Reflecting this, each event's GHG emission inventory has defined boundaries that are specific to the respective event and have evolved from the previous one. For this reason, the purpose of this carbon footprint report is to understand the environmental impact of the FIFA World Cup Qatar 2022 and how emissions can be mitigated and offset, rather than to compare results with previous or future events.



 Stadium seats

01. Introduction and context


Introduction and context

The FIFA World Cup (FWC) is an international football competition for the senior men's national teams of FIFA's member associations that takes place every four years.

The next FWC will take place in Qatar from 21 November to 18 December 2022. Qatar is the first Middle Eastern nation and also the smallest country to host a FIFA World Cup. All stadiums will be within 50km of the centre of Qatar's capital city, Doha, keeping travel between matches to a minimum.

Among many other activities, staging the tournament entails transporting thousands of people to the matches and Fan Fests, the provision of accommodation, managing waste in the stadiums and broadcasting fixtures in over 200 countries. This scale inevitably has an impact on the climate, yet conscientious sustainability efforts can mitigate its impact.

As the organisers of this tournament, FIFA, the FIFA World Cup Qatar 2022 LLC (Q22), and the Supreme Committee for Delivery & Legacy (SC) (see Table 1) have jointly developed the **FIFA World Cup 2022 Sustainability Strategy**. As one of the objectives, they have pledged to mitigate and offset all of the tournament's greenhouse gas (GHG) emissions, while advancing low-carbon solutions in Qatar and the region. One important part of understanding the environmental impact is the estimation of the GHG emissions caused by the preparation, staging and post-event activities of the competition.

© SC *A rider taps in his ticket to board the Doha Metro*

Table 1: Tournament organisers

Tournament organisers' information		
FIFA	Website	**www.fifa.com**
	Information	FIFA, world football's governing body, is the owner of the FIFA World Cup and the ultimate decision-making authority for the tournament, setting the technical requirements, coordinating the delivery of the competition and managing the key tournament stakeholders.
FIFA World Cup Qatar 2022 LLC	Website	**www.fifa.com/worldcup/organisation/llc/**
	Information	The FIFA World Cup Qatar 2022 LLC is a limited liability company incorporated by FIFA and the Qatar 2022 Local Organising Committee. It is responsible for the planning and delivery of operations and services for the tournament, directly supporting the day-to-day delivery of the matches in accordance with the requirements of each constituent group and FIFA.
Supreme Committee for Delivery & Legacy (SC)	Website	**www.qatar2022.qa/en**
	Information	Established in 2011, the SC is the lead Qatari government entity responsible for the delivery of the tournament stadiums, infrastructure and associated services, as well as the coordination and delivery of host country operations and legacy programmes associated with these projects.

This report presents the system boundaries, methodology, data inventory and results of the GHG accounting of the FWC 2022. For the calculation of the emissions presented in this report, projections have been made based on the available assumptions at the time of the development of the computations. The assumptions that have been made for the largest emission sources are presented in Annexe II.

Changes in a number of underlying elements may take place up until the publication of this report, including the decision that Qatar will host the FIFA Arab Cup in 2021 as a test event for the FWC 2022, affecting these assumptions. The emissions from this tournament, as well as any other changes in current assumptions, will be reported in the ex-post GHG accounting report.

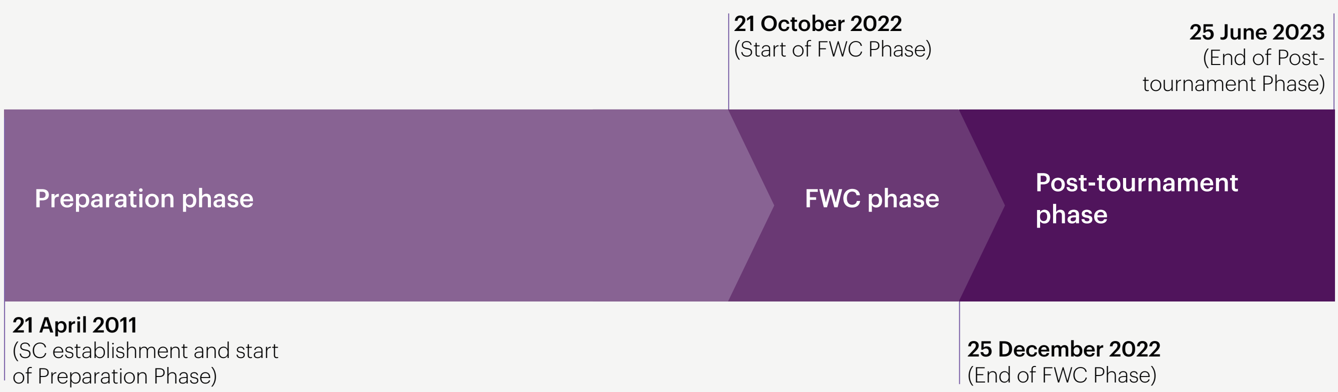
© SC *Souvenir shop at a local marketplace*

1.1 Reporting period

The reporting period is divided into three phases: **the preparation phase, the FWC phase, and the post-tournament phase**, as presented in Figure 3.

The tournament preparation phase begins with the establishment of the SC on 21 April 2011, shortly after Qatar was awarded the tournament hosting rights, and runs until 20 October 2022. The preparation phase includes activities, such as preparatory events, infrastructure construction, preparatory business operations and similar. The subsequent FWC phase, from 21 October to 25 December 2022, includes all activities during the tournament, as well as the participating teams' arrival in and departure from Qatar. The post-tournament phase includes the dismantling of temporary structures and post-event logistics, and is assumed to be concluded on 25 June 2023, six months after the end of the tournament phase. The preliminary competitions organised across the world to determine the teams that will secure the 31 available spots at the FWC 2022 are not included in the scope of this report as they are considered separate events, not under the operational control of the tournament organisers. Similarly, preliminary draws taking place outside of Qatar are not considered within the scope of this report.

Figure 1: Overview of the reporting period



© Getty Images *Jorge Jesus, Head Coach of CR Flamengo, gives instructions to Diego of CR Flamengo during the FIFA Club World Cup Qatar 2019 Final*

1.2 System boundaries

Previous GHG emission estimates were conducted by FIFA for the following events:

- 2006 FIFA World Cup™ (FIFA, 2006);
- 2010 FIFA World Cup™ (FIFA, 2010);
- FIFA Women's World Cup 2011™ (FIFA 2011);
- 2014 FIFA World Cup™ (MGM Innova, 2013); and
- 2018 FIFA World Cup™ (FIFA, 2016).

It is important to note that each FIFA World Cup is unique in its context, organisation and delivery. Reflecting this, each event's GHG emission inventory has defined boundaries that are specific to the respective event and have evolved from the previous one. While the boundaries of the current report are, to some extent, aligned with those defined in previous reports, the SC has been included as a reporting entity, expanding the boundaries to include key host country-related activities, such as the construction of stadiums and other venues used for the delivery of the FWC, allocating proportional impacts based on use. Thus, while some aspects of this GHG accounting are comparable to the estimated carbon emissions from past FWC events, each report needs to be looked at separately. For this reason, the purpose of this report is to understand the environmental impact of the FIFA World Cup Qatar 2022 and how emissions can be mitigated and offset, rather than to compare results with previous or future events.

1.2.1 Organisational boundaries

According to "The Greenhouse Gas Protocol: GHG Protocol: A Corporate Accounting and Reporting Standard – Revised Edition" (GHG Protocol), three different approaches can generally be chosen to determine the organisational boundaries of GHG accounting (World Resources Institute and World Business Council for Sustainable Development, 2004). The reporting entity can choose to account for and report its GHG emissions according to either the equity-share, the financial-control or the operational-control approach. In this case, there are three tournament organisers, with FIFA being the main reporting entity. The following paragraphs will compare the different approaches and explain the reasons for selecting the operational-control approach.

The equity-share approach is mostly relevant for corporate GHG accounting since it focuses on the economic risks and rewards in company operations and is closely aligned with a company's ownership of operations.

The financial-control approach is used when an entity has full financial control over operations, can direct the financial and operating policies of operations and has the right to the economic benefits.

The operational-control approach is used when an entity has operational control over operations and can implement and influence the operating policies.

For the FWC 2022, the operational-control approach was chosen. The organisational boundary is set from the perspective of FIFA, Q22 and the SC. They do not have financial control over all event operations, but they do have influence over all operations. The events and activities related to operating policies that FIFA, Q22 and/or the SC have operational control over, can implement and can influence are presented in Table 2.

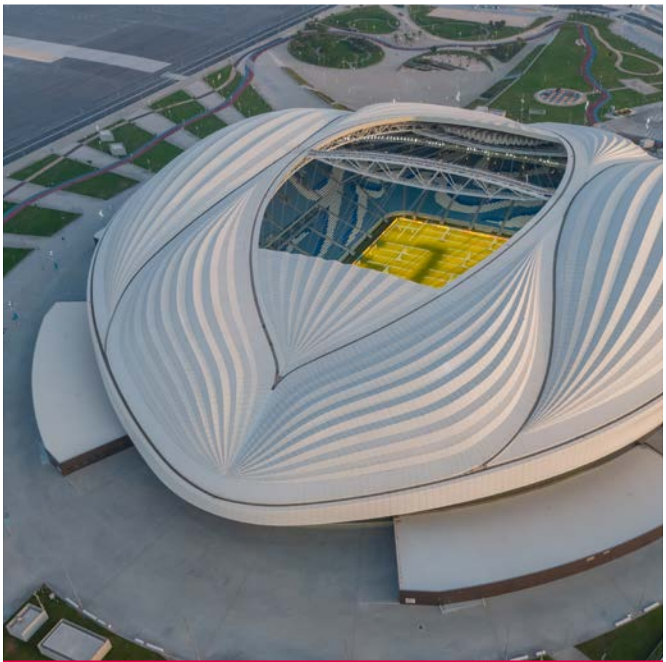
© SC *Inauguration of the 4th FWC 2022 Venue, Ahmad Bin Ali Stadium*

Table 2: Events and activities within operational control

Phase	Events and activities
Preparatory phase	FIFA, Q22 and SC business operations related to the FWC 2022
	Construction of permanent venues
	Construction of temporary facilities
	FIFA Club World Cup 2019™ (FCWC 2019)
	FIFA Club World Cup 2020™ (FCWC 2020)
	FWC Final Draw event
FWC phase	FWC 2022 matches
	FIFA World Cup banquet
	FIFA Fan Fests
	FIFA, Q22 and SC organisational operations related to the FWC 2022
Post-tournament phase	Dismantling and logistics
	FIFA, Q22 and SC organisational operations related to the FWC

1.2.2 Operational boundaries

According to the GHG Protocol, emissions are divided into direct and indirect emissions (WRI and WBCSD, 2004). Direct emissions originate from sources owned or controlled by the reporting entity. Indirect emissions are generated as a consequence of the reporting entity's activities, yet they occur at sources owned or controlled by another entity. In this GHG account, the tournament organisers are the reporting entities.



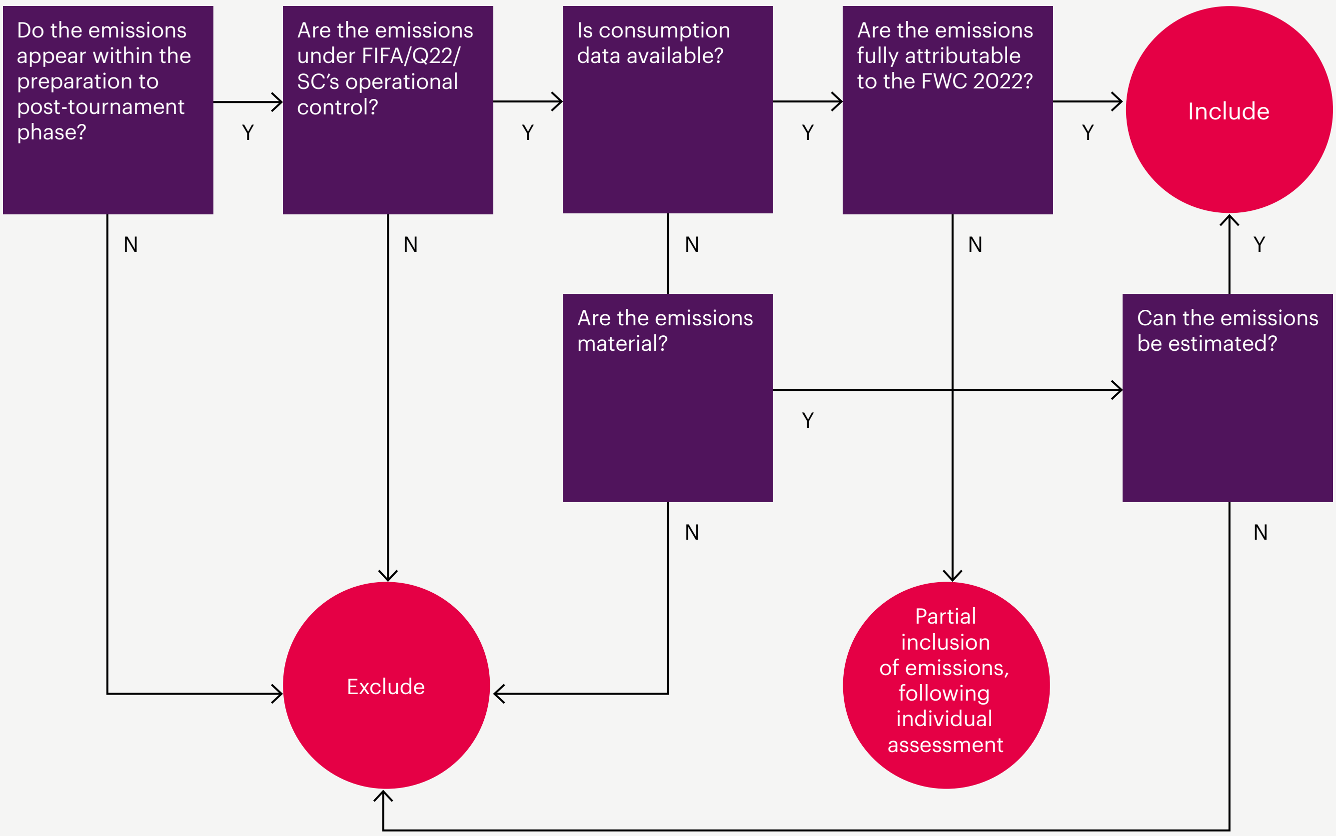
© SC *Aerial View of Al Janoub Stadium*

Direct and indirect emissions are divided into three scopes:

- **Scope 1:** all direct GHG emissions, such as emissions from combustion in owned or controlled boilers and vehicles, as well as fugitive emissions from the use of cooling;
- **Scope 2:** indirect GHG emissions from the generation of purchased electricity, heat, steam or cooling consumed by the reporting entity; and
- **Scope 3:** other indirect emissions, such as emissions from the extraction and production of purchased materials and fuels, vehicles not owned or controlled by the reporting entity, outsourced activities and waste disposal.

The included activities are presented in Table 3. The inclusion is made based on the inclusion/exclusion decision process shown in Figure 4.

Figure 4: Inclusion/exclusion criteria for emission sources



© SC *Smart City - Msheireb Downtown Doha - one of several accommodation options for visitors*

Table 3: Included activities and emission sources

Emission sources and activities	Phase
Transportation	
International and local transport for tournament organisers' workforce and volunteers	All phases
International and local transport for attendees, participants and other tournament-time workforce (e.g. stewards, concessionaires, etc.)	Preparation, FWC
Accommodation	
Hotel accommodation for tournament organisers' personnel and volunteers	All phases
Accommodation for attendees, participants and other tournament-time workforce (e.g. stewards, concessionaires, etc.)	Preparation, FWC
Venues	
Construction of stadiums and venues, including all life-cycle phases including extraction of materials, freight, energy, and emissions related to construction workers	Preparation
Construction of temporary facilities, including material use	Preparation, FWC
Venue operations related to the FWC	Preparation, FWC
Office operations related to the FWC	All phases
Tree nursery operations	All phases
Dismantling of temporary facilities	Post-tournament
Dismantling of stadiums and venues	Post-tournament
Logistics	
Freight transport	All phases
Warehouse operations	All phases
Goods and services	
Merchandise production	Preparation
Food and beverage	Preparation, FWC
Printed matter and marketing materials	Preparation, FWC
IT materials and online activities	Preparation, FWC
Media	
Media infrastructure	Preparation, FWC
Media operations	Preparation, FWC

To ensure that all material emission categories are included in the GHG accounting, all of the emission categories from the GHG Protocol were compared to the included event activities. Some emission categories are deemed to be not applicable to the event. The direct and indirect emissions from the different activities are divided into three scopes, as shown in Table 4.

Table 4: Overview of emission categories

Emission category	Emission sources	Boundary	Tournament activities
Scope 1			
Stationary combustion	Generation of electricity and heat	Included	Venue operations
Mobile combustion	Company-owned or leased vehicles	Included	Transport
Physical or chemical processing	Manufacture or processing of chemicals and materials	Not applicable	No relevant activities
Fugitive emissions	Emissions from the use of cooling systems and air conditioning equipment	Included	Venue operations
Scope 2			
Electricity	Purchased electricity	Included	Venue and office operations
Steam	Purchased steam	Not applicable	No relevant activities
District heating	Purchased district heating	Not applicable	No relevant activities
District cooling	Purchased district cooling	Included	Venue and office operations
Scope 3			
Purchased goods and services	Purchased goods (raw materials) and services	Included	Construction Merchandise Printed matter Marketing materials Online media
Capital goods	Production of capital goods (e.g. machinery, equipment, etc.)	Not applicable	No relevant activities
Fuel- and energy-related activities	Upstream life-cycle emissions from fuel and electricity generation, including transmission and distribution losses	Included	Venue and office operations
Upstream transportation and distribution	Transportation and distribution of goods and services to the company	Included	Construction Logistics Dismantling
Waste generated in operations	Management of operational waste (landfilling, recycling, etc.)	Included	Venue and office operations
Business travel	Travel and accommodation of employees, contractors, volunteers and event attendees	Included Included	International air travel International ground travel Intra-city ground travel Accommodation
Employee commuting	Employee travel between home and work	Outside of system boundaries	
Upstream leased assets	Operation of assets leased by the organisation (lessee) in the reporting period and not included in Scope 1 or 2	Included	Venue and office operations
Downstream transportation and distribution	Transportation and distribution of products sold by the organisation	Not applicable	No relevant activities

Processing of sold products	Processing of intermediate products sold by the organisation	Not applicable	No relevant activities
Use of sold products	Use of sold goods that require energy to operate	Not applicable	No relevant activities
End-of-life treatment of sold products	Waste disposal and treatment of sold products	Not applicable	No relevant activities
Downstream leased assets	Operation of assets owned by the company as lessor	Not applicable	No relevant activities
Franchises	Operation of franchises	Not applicable	No relevant activities
Investments	Operation of investments	Not applicable	No relevant activities

© SC *Cooling Technology at Al Bayt Stadium*

1.3 Methodology

1.3.1 Data inventory and assumptions

The data inventory process focused on collecting data for emission sources of the activities with the potentially largest emissions during the reporting period. Activity data was collected from FIFA, Q22 and SC personnel. The data includes both actual activity data from the planning phase and estimated data for 2019 to 2023. Where data is lacking, estimations are made based on statistics and available data from, for instance, the 2014 FIFA World Cup Brazil™ Carbon Footprint and 2018 FIFA World Cup Greenhouse Gas Accounting reports and design documentation for FIFA World Cup 2022 stadiums. A complete overview of activity data, extrapolations and estimations is provided in Annexe II.

The choice of assumptions and emission factors follows a conservative approach. Emission factors are derived from credible sources, such as Ecoinvent (version 3.6), the UK Department for Business, Energy and Industrial Strategy (BEIS) and the International Energy Agency (IEA).

© SC *Lusail Stadium Construction Progress*

1.3.2 Calculation principles

The GHG accounting and reporting procedure is based on the GHG Protocol and the complementary "Corporate Value Chain (Scope 3) Accounting and Reporting Standard", the most widely used international accounting tools for government and business leaders to understand, quantify and manage GHG emissions. The standards were developed in a partnership between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

The accounting of this carbon footprint is based on the following GHG Protocol principles:

- **Relevance:** an appropriate inventory boundary that reflects the company's GHG emissions and serves the decision-making needs of users;
- **Completeness:** accounting includes all emission sources within the chosen inventory boundary. Any specific exclusion is disclosed and specified;
- **Consistency:** meaningful comparison of information over time and transparently documented changes to the data;
- **Transparency:** data inventory sufficiency and clarity, where relevant issues are addressed in a coherent manner; and
- **Accuracy:** minimised uncertainty and avoided systematic over- or under-quantification of GHG emissions.

1.3.3 Methodology for the FWC 2022 stadiums

The stadium construction emissions were calculated according to the GHG Protocol: A Product Life Cycle Accounting and Reporting Standard, and the ISO 14040 Life Cycle Assessment Standard with a focus on climate impact.

Seven new stadiums and 30 training sites are being built in Qatar, with one stadium having undergone refurbishment. While the stadiums are to be used for the FWC 2022, they are designed for long-term use. The stadiums have legacy plans that will provide space not only for sports events and activities, but also for other facilities, such as hotels, malls, event and community facilities, and health centres. For this reason, the estimated life-cycle emissions are allocated to the FWC 2022 emission inventory based on the stadiums' operational period of 46 days for the tournament and 12 days each for the two FCWCs.

To meet the tournament seating requirements, six of the stadiums will be equipped with extra seating for the FWC 2022 that will be demounted and reused at other locations once the tournament is over. One of the stadiums will be fully converted for other non-sporting purposes. This includes more than 170,000 temporary seats in these seven stadiums and the temporary upper tiers that support them. The stadiums will then have a legacy use with fewer seats and repurposed spaces or will be fully repurposed for other uses. In addition, one of the stadiums, Ras Abu Aboud, is temporary and will be fully demounted after the event and used in a new location. The materials and construction emissions from these stadiums' temporary infrastructure that are built and used for the tournament only, including those of the temporary Ras Abu Aboud Stadium, are fully allocated to the calculation of FWC 2022 emissions. The following allocation methodology is applied.

The major contributors to the emissions for the temporary seating are the materials used in temporary tier structures and in the seats. The emissions for the seats are calculated for one seat and multiplied for all of the temporary seats in the respective stadiums. Similarly, the emissions from the demountable upper tier are calculated for one stadium and multiplied for all other stadiums with demountable upper tiers. This is done by dividing the total emissions from that one upper tier by the total number of temporary seats to create a specific emission factor which was applied to all other temporary seats per stadium to calculate emissions from the other upper tiers based on their sizes. The emissions associated with energy use during construction, freight and dismantling activities are apportioned based on overall construction data.

Throughout the report, the temporary infrastructure of these stadiums is allocated under the "permanent venues" category and will be referred to as "temporary infrastructure". In addition, the report accounts for emissions from the "temporary facilities" as a separate emission category which relates to temporary event overlay, such as tents, temporary power, flooring, fencing, etc.

1.3.4 Global Warming Potential (GWP)

GWP is a measure of the climate impact of a GHG compared to carbon dioxide over a time horizon. GHGs have different GWP values depending on their efficiency to absorb longwave radiation and the atmospheric lifetime of the gas. The GWP values used in the GHG accounting are the six GHGs covered by the Kyoto Protocol and are presented in Table 5. This table will be updated with additional GHGs if needed. The source of the applied GWPs is the Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5), 2014.

Table 5: Applied global GWPs

GHG	GWP (100 years)
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Nitrous oxide (N_2O)	265
HFC-134a	1,300
HFC-407C	1,624
HCFC-22	1,760
Iso-butane (R-600A)	3
Sulphur hexafluoride (SF_6)	23,500

(Source: IPCC AR5, 2014)

02.
Results

Results

The results of the FWC 2022 GHG accounting are presented in this chapter. First, the total FWC 2022 emissions are presented per scope. Second, the emissions are broken down by phase: preparation, FWC and post-tournament. Finally, the last three chapters analyse the three hotspot emissions across those three phases: travel, accommodation and infrastructure construction emissions, which together represent over 96% of total emissions.

"Total emissions" in this report refers to the emission sources covered, as described in section 1. Please note that, due to rounding, the figures may not add up exactly to the total provided.

© SC *A metro car exits its station. Tournament venues will be within easy reach of the metro network.*

2.1 Emissions per scope (all three phases)

Table 6: Key figures

Scope	Emissions (tCO_2e)	Percentage of total (%)
Scope 1: direct GHG emissions	35,103	1%
Scope 2: indirect GHG emissions from purchased electricity, heating and cooling	37,216	1%
Scope 3: other indirect GHG emissions	3,558,715	98%
Total	**3,631,034**	**100%**

Table 6 and Figure 5 aggregate emissions from all phases of the FWC 2022, including the preparatory, FWC and post-tournament phases. The estimated GHG emissions are 3.63 million tCO_2e, the majority of which are concentrated in Scope 3 (98%).

Figure 5: Emissions per scope (Thousands tCO_2e)

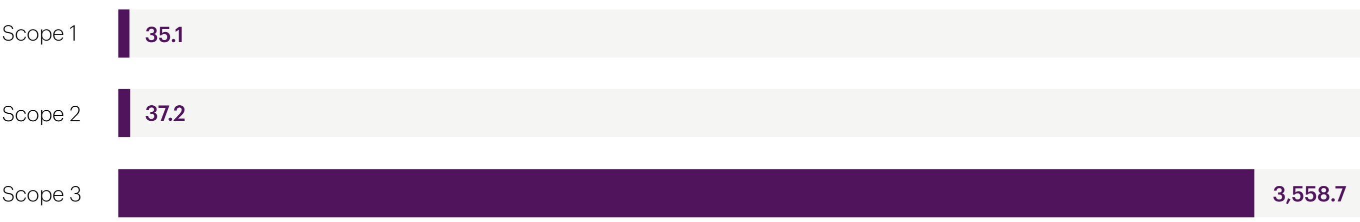
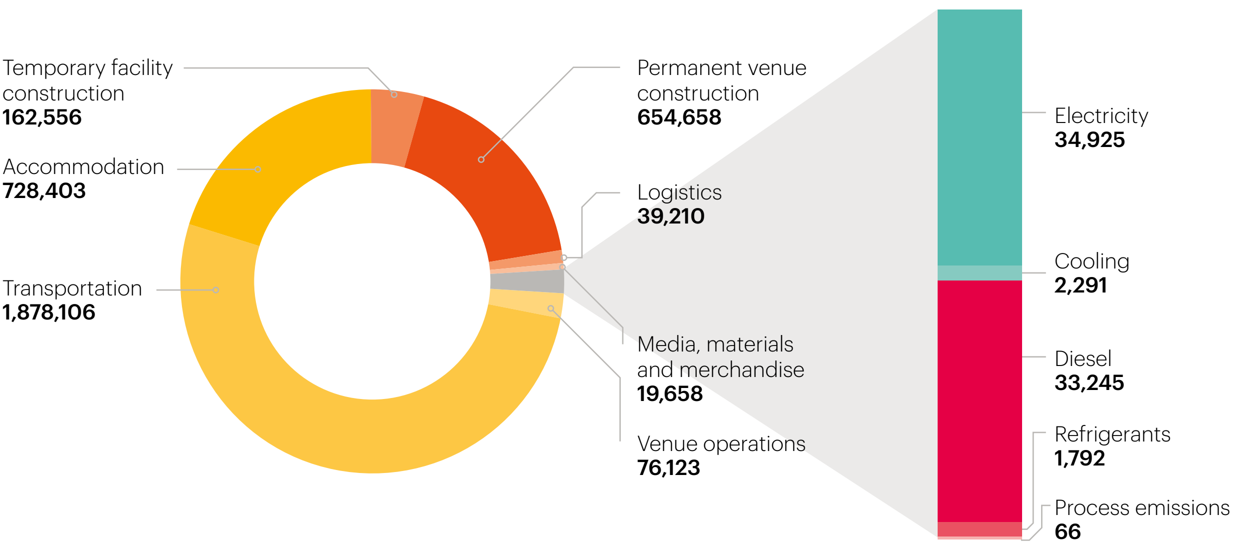


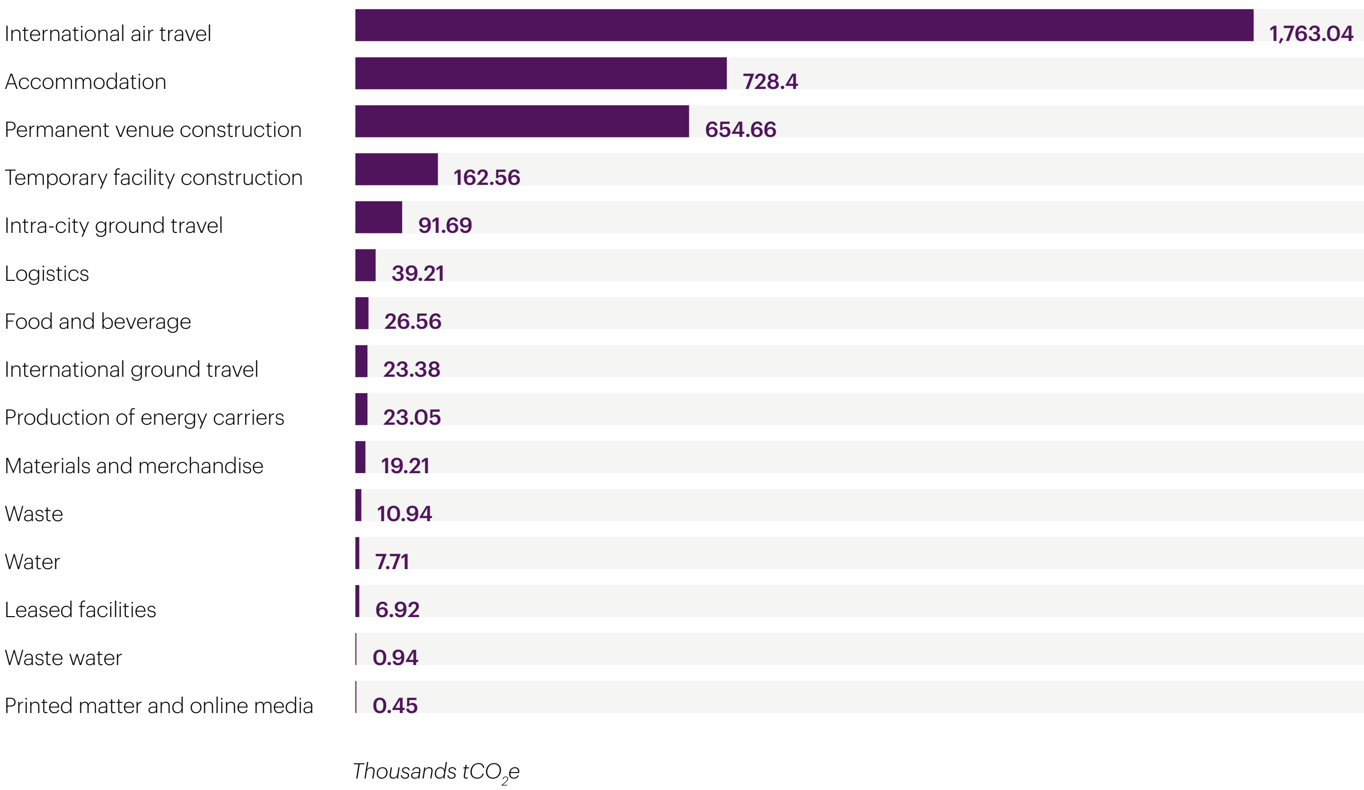
Figure 6: Sources of GHG emissions Scope 1 (pink), Scope 2 (turquoise) and Scope 3 (yellow/orange) in tCO2e (Scope 1 and 2: 72.32 thousand tCO_2e, Scope 3: 3.56 million tCO_2e)



2.2 Emissions per category and event

When looking at the different emission categories across all scopes (Figure 7), the main emission sources, representing 94.3% of total GHG emissions, are travel (51.7%), accommodation (20.1%), permanent venue construction (18.0%) and temporary facility construction (4.5%). Of the remaining 5.7% of total emissions, the main drivers are logistics, food and beverage, production of energy carriers, materials and merchandise. Figure 7 and Figure 8 show the GHG emissions per scope and activity across all three phases.

Figure 7: Sources of GHG emissions: Scope 3 (3.56 million tCO_2e)



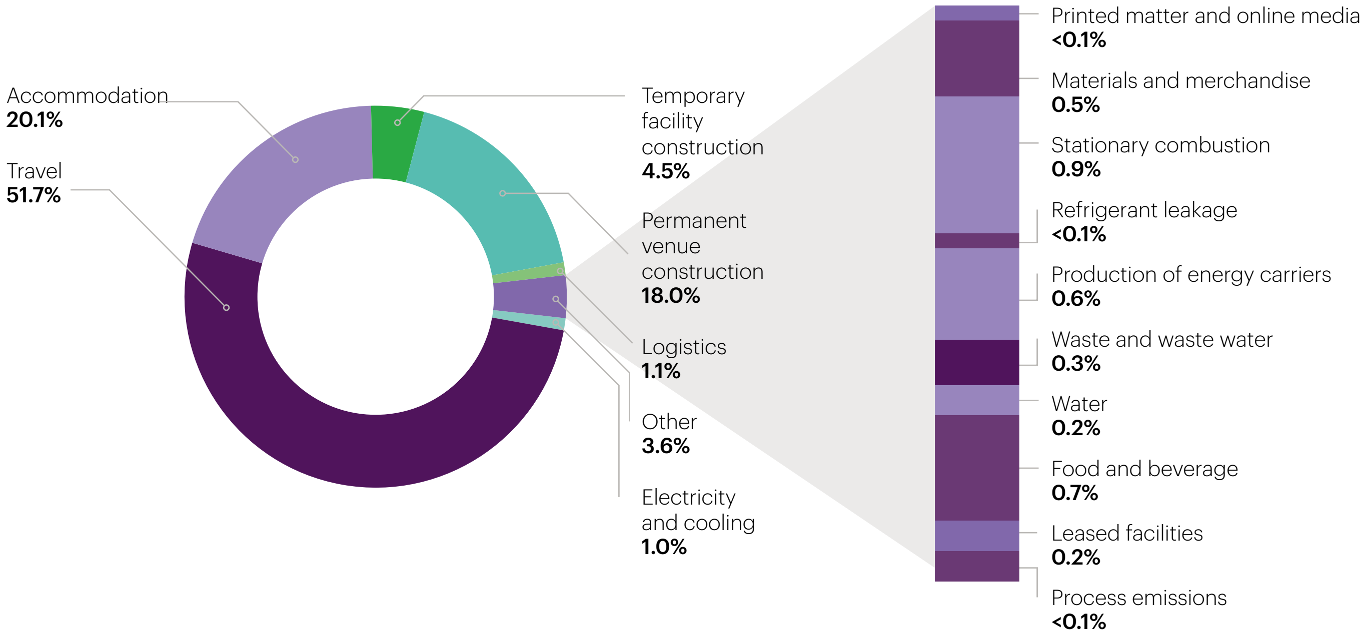
© Getty Images *Vitinho of CR Flamengo is shown a yellow card by referee Abdulrahman Al-Jassim during the FIFA Club World Cup Qatar 2019 Final match*

Among the main emission category, 51.7% of emissions stem from travel, 20.1% from accommodation, 18% from permanent venue construction, 4.5% from temporary facility construction and 1.1% from logistics.

52%

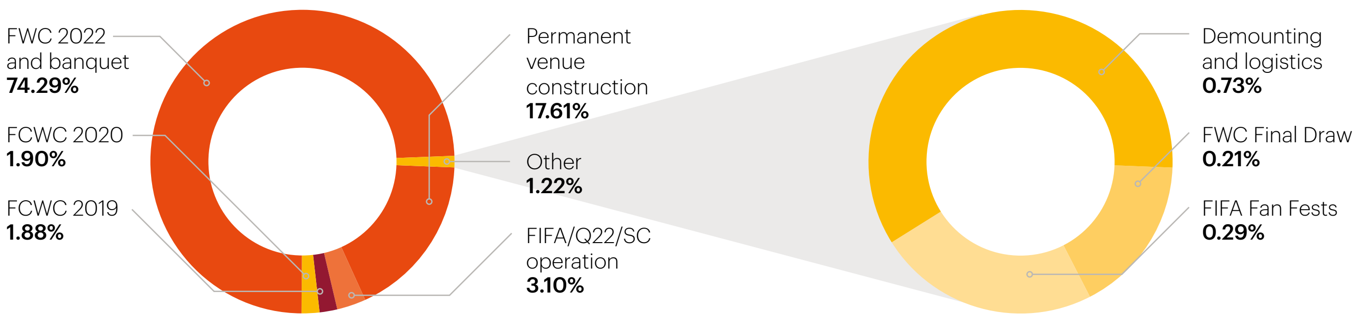
of the emissions for the FWC 2022 comes from travel

Figure 8: Distribution of emission sources for the FWC 2022 (3.63 million tCO_2e)



Providing another perspective, Figure 9 shows how total GHG emissions are distributed by event and activity (for reference, see Table 2).

Figure 9: Total GHG emissions distribution per event and activity



2.3 Emissions per phase

This section gives an overview of GHG emissions generated during each phase of the FWC 2022. Comparing the climate impact of the preparation, FWC and post-tournament phases, 75% of GHG emissions are caused during the FWC phase (Figure 10) even though the preparation phase (25% share of total emissions) happens during a much longer time period. The post-tournament phase has the lowest contribution at 1%. The emission distribution between each phase is presented in Figure 10.

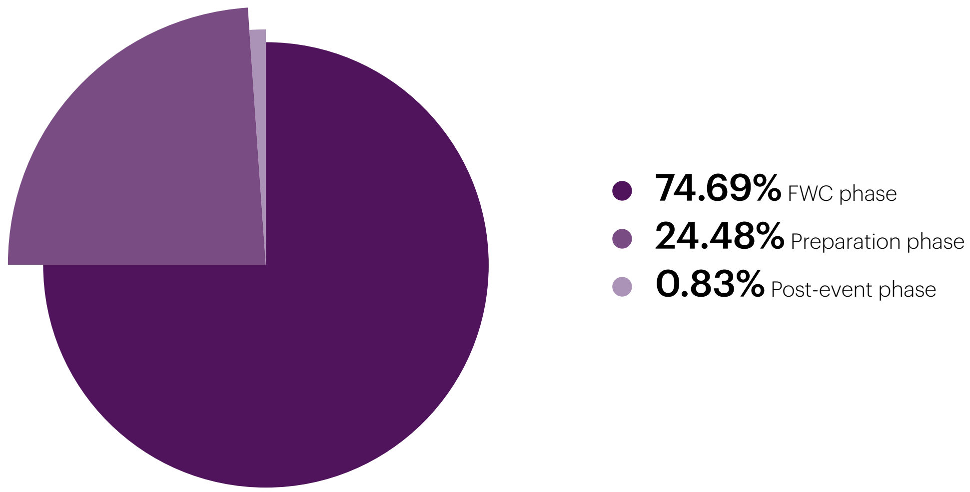
75%

of GHG emissions are caused during the FWC phase

Table 7: Results by scope and phase

Scope	Preparation phase (tCO_2e)	FWC phase (tCO_2e)	Post-tournament phase (tCO_2e)	Total (tCO_2e)
Scope 1	514	34,574	16	35,103
Scope 2	27,753	7,874	1,590	37,216
Scope 3	860,586	2,669,730	28,398	3,558,715
Total	**888,852**	**2,712,178**	**30,004**	**3,631,034**
Percentage per phase	24.5%	74.7%	0.8%	100%

Figure 10: Total GHG emissions distribution per phase



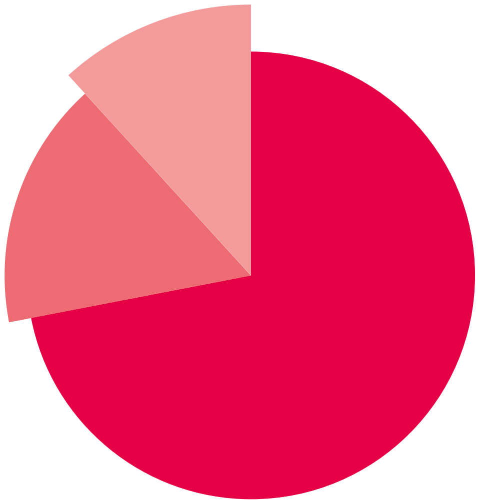
2.3.1 Preparation phase

Overall, it is estimated that permanent venue construction, and thus, the construction of stadiums, will have the largest climate impact of the preparation phase with 72% (Figure 11). The GHG emissions per event or activity within the preparation phase are presented in Table 10. The emissions from FIFA, Q22 and the SC within the preparation phase consist of the climate impact related to the preparation and organisation of the FWC tournament, including emissions linked to offices, travel and accommodation. Preparation events include the FCWC 2019, the FCWC 2020 and the FWC Final Draw.

The construction of stadiums will have the largest climate impact of the preparation phase at

72%

Figure 11: Emission distribution of the preparation phase



- **72%** Permanent venue construction
- **16%** Preparation events
- **12%** FIFA, Q22 and SC operations

Table 8: Results of the preparation phase by event or activity

Scope	Permanent construction of venues (tCO_2e)	FCWC 2019 (tCO_2e)	FCWC 2020 (tCO_2e)	FWC Final Draw (tCO_2e)	FIFA/Q22/SC operations (tCO_2e)	Total (tCO_2e)
Scope 1	0	35	109	0	370	514
Scope 2	0	280	516	0	26,956	27,753
Scope 3	639,482	67,914	68,415	7,460	77,315	860,586
Total	**639,482**	**68,228**	**69,040**	**7,460**	**104,641**	**888,852**

© SC *Tram at Mshereib. The tram links all areas of Msheireb Downtown Doha within 18 minutes.*

Table 9 below gives a further breakdown of the GHG emissions per category for the preparation phase, showing a detailed overview of all major and minor GHG sources.

Table 9: Breakdown of results of the preparation phase per event or activity

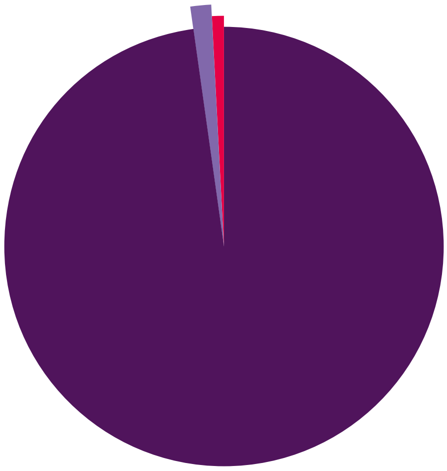
Activity	Permanent construction of venues (tCO_2e)	FCWC 2019 (tCO_2e)	FCWC 2020 (tCO_2e)	FWC Final Draw (tCO_2e)	FIFA/Q22/SC op. (tCO_2e)	Total emissions (tCO_2e)	%
Scope 1	**0**	**35**	**109**	**0**	**370**	**514**	**0.1%**
Refrigerant leakage	0	34	108	0	370	511	0.1%
Process emissions		1	1	0	0	2	0.0%
Scope 2	**0**	**280**	**516**	**0**	**26,956**	**27,753**	**3.1%**
Grid electricity	0	249	394	0	26,956	27,599	3.1%
District cooling	0	31	123	0	0	154	0.0%
Scope 3	**639,482**	**67,914**	**68,415**	**7,460**	**77,315**	**860,586**	**96.8%**
Travel	0	51,609	51,607	6,937	47,989	158,140	17.8%
International air travel	0	50,379	50,379	6,874	47,989	155,621	17.5%
International ground travel	0	904	904	4	0	1,812	0.2%
Intra-city ground travel	0	324	324	59	0	707	0.1%
Accommodation	0	14,843	14,843	502	4,528	34,715	3.9%
Purchased goods and services	639,482	1,239	1,577	18	5,014	647,330	72.8%
Water	0	34	45	0	5,014	5,093	0.6%
Food and beverage	0	1,081	1,081	11	0	2,172	0.2%
Temporary facility construction	0	0	0	7	0	7	0.0%
Permanent venue construction (FWC-specific and allocated emissions)	639,482	125	451	0	0	640,058	72.0%
Logistics	0	57	57	0	0	114	0.0%
Waste generation	0	66	144	1	8,255	8,465	1.0%
General waste	0	65	143	1	7,379	7,588	0.9%
Waste water treatment	0	1	1	0	876	877	0.1%
Leased facilities	0	0	0	2	0	2	0.0%
Fuel and energy-related activities	0	102	186	0	11,529	11,820	1.3%
Total GHG emissions	**639,482**	**68,228**	**69,040**	**7,460**	**104,641**	**888,852**	**100%**

2.3.2 FWC phase

Within the FWC phase, FWC matches are estimated to generate the largest amount of GHG emissions (99.5%, Figure 12) from all activities which include matches, FIFA Fan Fests, the FWC banquet and FIFA, Q22 and SC operations. Based on the chosen accounting approach, it was assumed that attendees' primary reason to travel to Qatar would be to attend FWC matches. No attendees were assumed to travel only because of the FIFA Fan Fests and FWC banquet.

Figure 12 shows the emissions per activity and event in the FWC phase. The FIFA, Q22 and SC operations category consists of emissions related to the organisation of the tournament within the FWC phase, which includes travel to and from Qatar – including accommodation – for FIFA staff, as well as the tournament organisers' office operations. In total, the FWC phase will generate an estimated 2,712,177 tCO_2e. Similar to the tournament's overall GHG emissions, the travelling activities of attendees have the largest climate impact within the FWC phase (63.4%), followed by accommodation (25.6%) and temporary facility construction (6.0%).

Figure 12: Emission distribution of the FWC phase



- **99.5%** FWC matches
- **0.4%** FIFA Fan Fests
- **0.2%** FIFA, Q22 and SC operations
- **0%** FWC Banquet

© Kevin C. Cox/Getty Images *Artem Dzyuba of Russia scores his third goal during the 2018 FWC Russia match between Russia and Saudi Arabia*

Table 10: Results of the FWC phase per event or activity

Activity	FWC matches (tCO_2e)	FIFA Fan Fests (tCO_2e)	FWC banquet (tCO_2e)	FIFA/Q22/ SC op. (tCO_2e)	Total emissions (tCO_2e)	%
Scope 1	**34,566**	**0**	**0**	**8**	**34,574**	**1.3%**
Stationary combustion of diesel	33,245	0	0	0	33,245	1.2%
Refrigerant leakage	1,257	0	0	8	1,265	0.1%
Process emissions	64	0	0	0	64	0.0%
Scope 2	**7,079**	**0**	**0**	**795**	**7,874**	**0.3%**
Grid electricity	4,941	0	0	795	5,736	0.2%
District cooling	2,137	0	0	0	2,137	0.1%
Scope 3	**2,655,843**	**10,468**	**23**	**3,397**	**2,669,730**	**98.4%**
Travel	1,716,749	0	0	2,226	1,718,974	63.4%
International air travel	1,604,200	0	0	2,226	1,606,425	59.2%
International ground travel	21,568	0	0	0	21,568	0.8%
Intra-city ground travel	90,981	0	0	0	90,981	3.4%
Accommodation	693,336	0	0	250	693,586	25.6%
Purchased goods and services	204,853	8,405	20	297	213,574	7.9%
Water	1,929	213	0	297	2,439	0.1%
Food and beverage	16,184	8,192	12	0	24,388	0.9%
Printed media	13	0	0	0	13	0.0%
Online media	434	0	0	0	434	0.0%
Temporary facility construction	162,549	0	0	0	162,549	6.0%
Permanent venue construction (allocated emissions)	4,541	0	0	0	4,541	0.2%
Materials and merchandise	19,203	0	7	0	19,210	0.7%
Logistics	22,803	0	0	0	22,803	0.8%
Waste generation	1,938	984	1	311	3,235	0.1%
General waste	1,890	975	1	307	3,172	0.1%
Waste water treatment	49	10	0	4	62	0.0%
Leased facilities	5,841	1,079	2	0	6,922	0.3%
Fuel and energy-related activities	10,323	0	0	314	10,636	0.4%
Total GHG emissions	**2,697,487**	**10,468**	**23**	**4,200**	**2,712,178**	**100%**

2.3.3 Post-tournament phase

The post-tournament phase stretches from the end of the FWC phase to 25 June 2023. During this time, the temporary elements of the venues, such as temporary seats, the Ras Abu Aboud Stadium and the overlay infrastructure, will be demounted. In addition, FIFA-owned equipment used during the tournament will be shipped back to Switzerland. The emissions from the post-tournament phase are presented in Table 11 below.

Table 11: Estimated GHG emissions from the post-tournament phase

Activity	Dismantling and logistics	FIFA/Q22/SC op.	Total emissions	%
Scope 1	**0**	**16**	**16**	**0.1%**
Refrigerant leakage	0	16	16	0.1%
Scope 2	**0**	**1,590**	**1,590**	**5.3%**
Grid electricity	0	1,590	1,590	5.3%
Scope 3	**26,354**	**2,045**	**28,398**	**94.6%**
Travel (international air)	0	992	992	3.3%
Accommodation	0	102	102	0.3%
Purchased goods and services	10,060	174	10,234	34.1%
Water	0	174	174	0.6%
Permanent venue construction (demounting)	10,060	0	10,060	33.5%
Logistics	16,294	0	16,294	54.3%
Waste generation	0	181	181	0.6%
General waste	0	180	180	0.6%
Waste water treatment	0	1	1	0.0%
Leased facilities	0	0	0	0.0%
Fuel and energy-related activities	0	596	596	2.0%
Total GHG emissions	**26,354**	**3,651**	**30,004**	**100%**

 Antoine Griezmann, Paul Pogba, and Kylian Mbappe of France celebrate following their sides victory in the 2018 FIFA World Cup Final

2.4 Hotspot emissions

This section takes a step back and analyses the total GHG emissions from all phases of the FWC 2022. The purpose is to understand the tournament's carbon footprint by category. Those covered here (emissions from travel, accommodation, and infrastructure construction and operations) represent over 96% of total emissions.

2.4.1 Emissions from travel

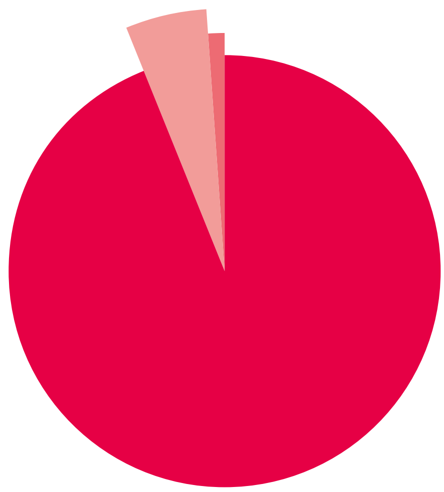
Emissions from travel account for 51.7% of total emissions across all phases. Figure 13 shows that 94% of travel-related emissions are caused by international air travel, 1% by international ground travel and 5% by intra-city ground travel in the host city.

To get a better picture of overall travel emissions, Table 12 presents GHG emissions from travel per phase of the FWC 2022.

94%

of travel-related emissions caused by international air travel

Figure 13: Distribution of total travel emissions by mode across all phases



- **94%** International air travel
- **5%** Intra-city ground travel
- **1%** International ground travel

Table 12: Estimated GHG emissions from travel per phase

Scope	International air travel (tCO_2e)	International ground travel (tCO_2e)	Domestic ground travel (tCO_2e)	Total (tCO_2e)
Preparation phase	155,621	1,812	707	158,140
FWC phase	1,606,425	21,568	90,981	1,718,974
Post-tournament phase	992	0	0	992
Total	**1,763,038**	**23,380**	**91,688**	**1,878,106**
%	93.9%	1.2%	4.9%	100%

The results show that emissions from attendees' international travel during the FWC phase dominate, representing 85.5% of total travel emissions and 44.2% of overall FWC 2022 emissions. The estimated travel emissions for the FWC phase per attendee category are presented in Table 13. The table is divided into three main groups: international air travel, international ground travel and domestic ground travel, which covers intra-city ground travel during the tournament. The attendee categories are further explained in Annexe II. The use of international travel by the general public attending FWC matches is estimated to generate the largest share of GHG emissions during the FWC phase, corresponding to 59.2% of emissions during this phase, or 34.7% of total FWC 2022 emissions.

Table 13: Estimated GHG emissions from attendees' travel within the FWC phase

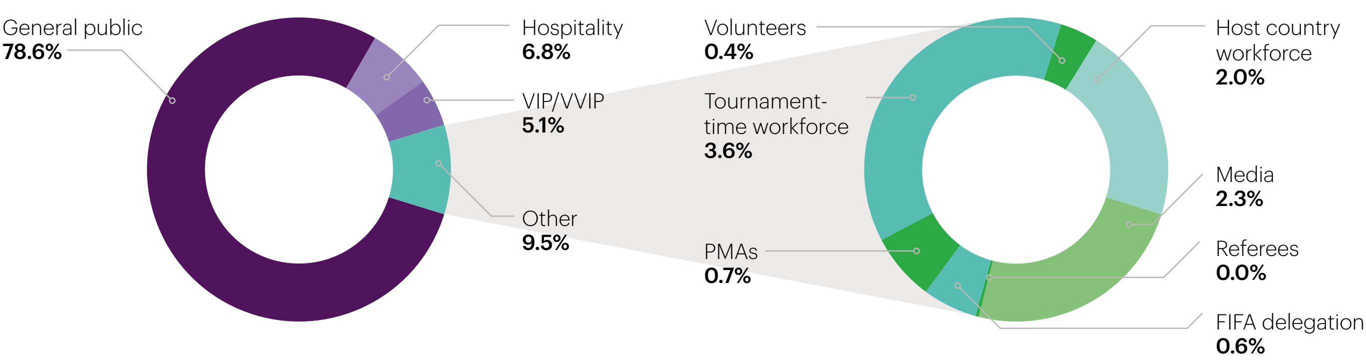
Activity	Attendee category	International air travel (tCO_2e)	International ground travel (tCO_2e)	Domestic ground travel (tCO_2e)	Total (tCO_2e)
FWC matches	General public	1,260,855	18,552	47,701	1,327,108
	Hospitality	109,351	458	3,788	113,597
	VIP/VVIP	81,496	416	2,172	84,084
	Media	36,952	157	8,740	45,849
	FIFA delegation	8,870	25	889	9,784
	Participating Member Associations (PMAs) and referees	11,489	31	2,789	14,309
	Tournament-time workforce	57,106	537	5,554	63,197
	Volunteers	6,199	227	2,674	9,100
FIFA/Q22/SC operations	Host country workforce	31,883	1,167	16,672	49,722
	FIFA/Q22/SC staff operational flights	2,226	-	-	2,226
Total		**1,606,425**	**21,568**	**90,981**	**1,718,974**

To provide further insight into the largest travel emissions for the FWC phase, Figure 14 gives a breakdown of air travel emissions per attendee category, with the general public accounting for the largest share.

General public travel emissions the highest in the attendee category at

79%

Figure 14: Distribution of FWC phase air travel emissions per attendee category



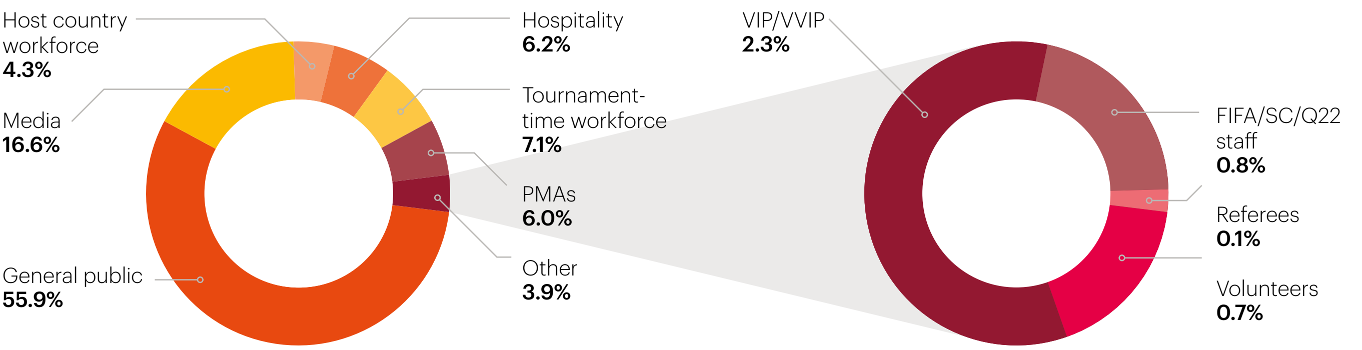
2.4.2 Emissions from accommodation

The total accommodation emissions for all phases of the FWC 2022 are estimated to be 728,408 tCO_2e, accounting for 20.1% of total emissions. The distribution between phases can be seen in Table 14. As in the previous section, Figure 15 dives deeper into the FWC phase, which is responsible for 95.2% of accommodation emissions. Within that phase, the general public is expected to contribute to the largest share of the accommodation emissions (55.9%). The distribution can be seen below.

Table 14: Estimated GHG emissions from accommodation per phase

Scope	Accommodation (tCO_2e)	%
Preparation phase	34,715	4.8%
FWC phase	693,586	95.2%
Post-tournament phase	102	0%
Total	**728,403**	**100%**

Figure 15: Distribution of FWC phase accommodation emissions per attendee category

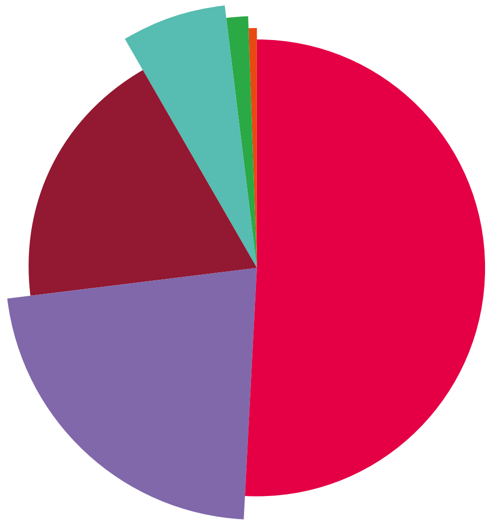


© SC *Dhow at sunset, Doha*

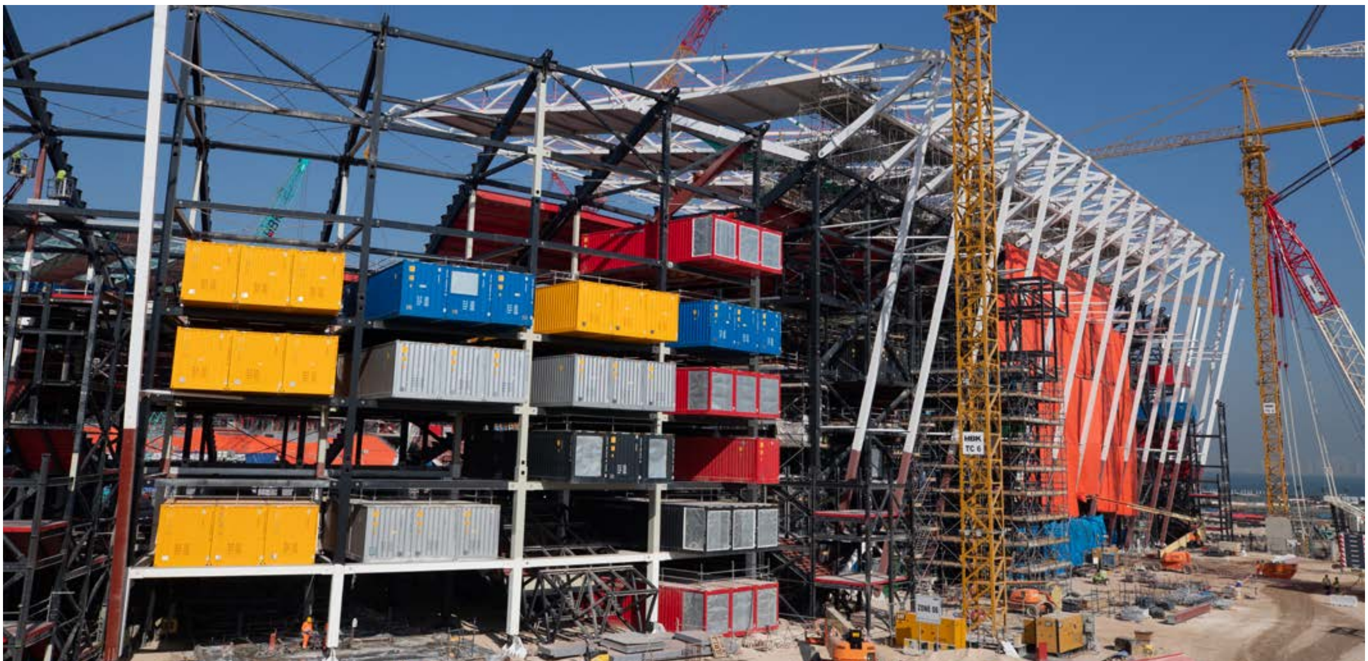
2.4.3 Emissions from infrastructure construction and operation

Infrastructure construction and operation is composed of the following categories: permanent venues (FWC share of permanent venue construction, operations and dismantling), temporary infrastructure (construction, operations and dismantling), and temporary facilities (construction, operations and dismantling). The total emissions from all these sources are estimated at 893,337 tCO_2e, or 24.6% of total FWC 2022 emissions. These categories are broken down in Table 15.

Figure 16: Distribution of infrastructure construction and operations emissions



- **51.1%** Ras Abu Aboud construction
- **22%** FWC specific seat construction
- **18.6%** Temporary facilities construction
- **6.6%** Permanent and temporary venue operations
- **1.2%** Dismantling
- **0.5%** FWC share of permanent venue construction

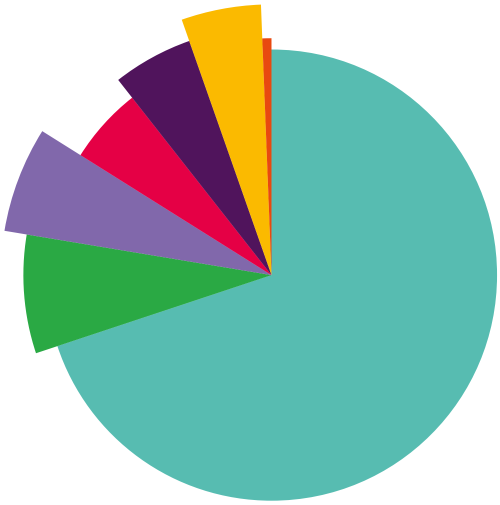


 Ras Abu Aboud Stadium Construction Progress

2.4.3.1 Permanent venues

The emissions from the temporary infrastructure construction are included in the permanent venue assessment of the preparation phase. This includes construction of the temporary seats and associated temporary structures in the permanent stadiums (202,126 tCO_2e), as well as the full construction emissions from the temporary Ras Abu Aboud Stadium (437,932 tCO_2e). These temporary infrastructure construction emissions account for 640,058 tCO_2e, or 17.6% of the total FWC 2022 emissions. Table 16 provides a breakdown of these emissions by stadium. The permanent infrastructure elements are allocated to the FWC carbon footprint based on the period of use for the two FCWCs and the FWC 2022. This FWC share of permanent venue construction emissions is 4,541 tCO_2e.

Figure 17: Distribution of FWC-specific seat construction of stadiums




© SC *Aerial View of Al Bayt Stadium*

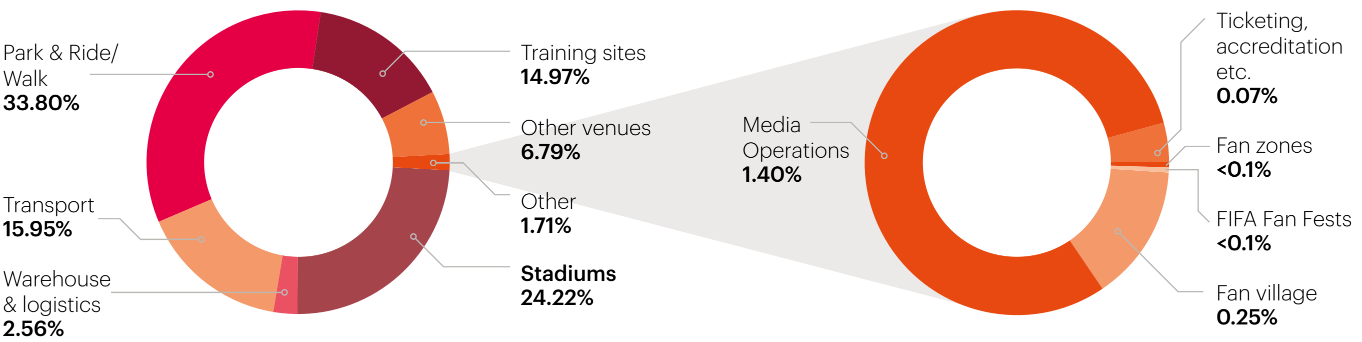
2.4.3.2 Dismantling

During the post-tournament phase, the temporary Ras Abu Aboud Stadium and the FWC-specific seating in six of the stadiums will be dismantled, temporarily stored and sent to other locations to be reused. The dismantling is estimated to contribute 10,059 tCO_2e, 0.3% of total FWC 2022 emissions. The storage and transport of these elements to new locations is considered to be outside the boundaries of this report.

2.4.3.3 Temporary facilities

In addition to the stadiums, several temporary facilities are needed, such as training sites and other temporary infrastructure for the stadiums. The total emissions from temporary facility construction are 162,556 tCO_2e, which is 4.5% of the tournament emissions. The total emissions from the construction of the 30 training sites are 24,181 tCO_2e. The distribution of emissions over the different facilities is presented in Figure 18. Note that the stadiums' temporary infrastructure elements are not included in this category, but are considered to be part of the permanent venues.

Figure 18: Distribution of emissions from temporary facilities



© SC *El Ersal Training Site, one of the 41 training sites for the teams that will participate in the FWC 2022*

2.4.3.4 Operation of permanent venues and temporary facilities

The venue operations during the FWC phase include diesel used for generators, electricity use, cooling electricity, refrigerant leakage, water use, waste water treatment, waste generation and field maintenance. Table 15 presents an overview of all venues and activities included. At 62,439 tCO_2e, venue operations represent about 2.3% of FWC phase emissions, or 1.7% of the total FWC 2022 emissions.

Table 15: Estimated GHG emissions from operations during the FWC phase

Venue	Days of use	tCO_2e
Temporary generators for all venues	150	40,992
Stadiums	46	10,194
Media	61	4,576
Training facilities	46	3,869
Ticketing venues (main ticketing centre, additional ticket collection locations, airport ticket collection location, respectively)	210, 112, 70	1,188
Volunteers centre	150	449
Main accreditation and uniform centre(s)	150	330
FIFA team wear distribution and tailors	150	273
FIFA Congress site	15	231
Warehouse	150	214
VVIP FIFA Club village	46	123
Total		**62,439**

 Players of Morocco warm up prior to the 2018 FIFA World Cup Russia group B match between Portugal and Morocco

03.
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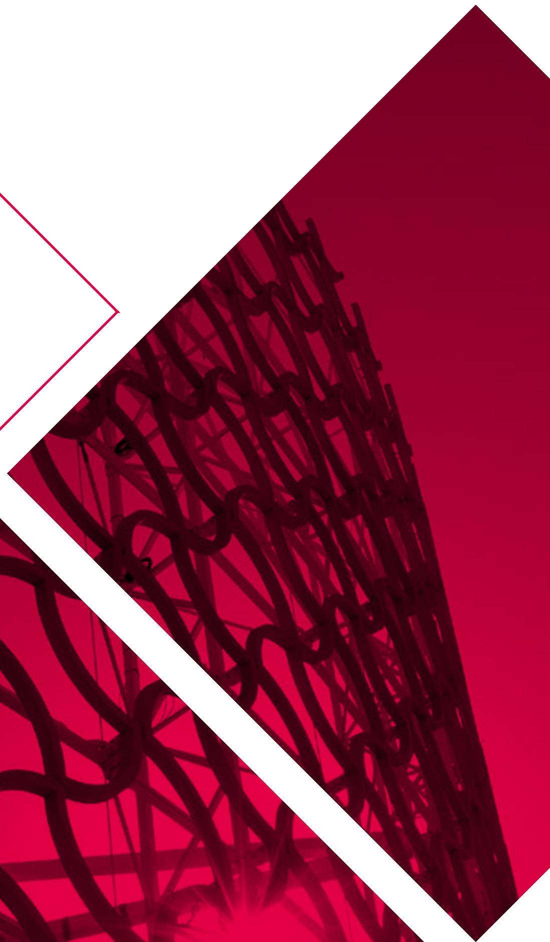
Annexes



Annexe I
Emission factors

To calculate GHG emissions, each activity or material has to be linked with a specific emission factor: the carbon impact released when that specific activity took place or that material was used. Below is an overview of the different databases that have been utilised for the calculation of emissions under the scope of this report, most of which are not managed by South Pole.

Table 16: Emission factor references

Activity	Emission factor reference[1]
Fuels	UK BEIS 2019
Electricity	Mohammed, 2016 IEA, 2019 for transmission and distribution; UK BEIS 2019 for upstream well-to-tank emissions
Air travel	UK BEIS 2019, including Radiative Forcing Index of 1.9
Ground travel	UK BEIS 2019
Freight	UK BEIS 2019
Accommodation	CHSB 2019
Food and beverage	South Pole database on food EF (LCA data)
Water, desalinated	Mannan et al., 2019
Water, treated sewage effluent (TSE)	Biswas et al., 2019
Waste and waste water	Ecoinvent v3.6
Materials	UK BEIS 2019, Ecoinvent v3.6, Environmental Product Declaration (EPD) data

[1] South Pole derives its emission factors from reliable and credible sources. South Pole is not responsible for any inaccuracies in emission factors provided by third parties.

© Getty Images *Aerial view of the FIFA Fan Festival and the Luzhniki Stadium during the 2018 FIFA World Cup Final match*

Annexe II
Assumptions and data sources

The following section outlines the key assumptions and underlying data sources that are made for the calculation of the FWC 2022's main emission categories.

Travel

It is assumed that attendees' primary reason to travel to Qatar is to attend FWC matches during the FWC phase. No attendees are assumed to travel internationally only because of the FIFA Fan Fests[2] and the FWC banquet. In the preparation phase, attendees will travel to Qatar to attend FCWC matches in 2019 and 2020, and the FWC Final Draw.

FWC matches

The tournament organisers provided detailed projections on the expected attendees for the FWC phase, which was completed by data on the actual attendee numbers from the 2018 FWC in Russia. Spectators are assumed to account for 86% of the individuals attending the event. It is assumed that each attendee has three match tickets on average.

Table 17: Expected attendees for the FWC phase

Attendee category	Details	%
General public	PMA supporters Individual tickets Group sales customers	4.5% 57.5% 16.9%
Hospitality		4.7%
V/VIP		2.7%
Media	Journalists and photographers Host country media Host Broadcast Services Non-rights holders Broadcasters: TV from various countries	0.3% 0.2% 0.3% <0.0% 1.1%
FIFA, SC and Q22 staff	FIFA delegation FIFA staff SC staff Q22 staff	0.1% <0.0% 0.1% 0.1%
PMAs	Players Team officials Family and friends	0.1% 0.2% 0.4%
Referees		<0.0%
FIFA & Q22 tournament-time workforce	Venue personnel, ticketing, security, hawkers, food staff, hospitality staff, etc. FIFA commercial partners Official licensees and on-site retail	2.5% 1.4% 0.3%
Volunteers	FIFA/Q22 tournament-time volunteers Host country volunteers	0.7% 0.4%
Host country workforce	Temporary workforce Contractors	<0.0% 5.6%

[2] Based on projections available when developing the calculations, it was assumed that FIFA Fan Fests would be held in three different locations throughout Qatar.

The provided estimations also include a projection of the origin of the general public attendees. The origin for hospitality, media, PMAs and referees was based on data on the actual attendee numbers from the 2018 FWC in Russia. The origins of the rest of the attendee categories were assumed based on input from the tournament organisers from the planning of the FWC 2022. The split per attendee category between international and domestic origin is presented in Table 18.

Table 18: Estimations of attendee category origins

Attendee category	International origin	Domestic origin
General public Group sales customers	74% 77%	26% 23%
Hospitality	77%	23%
V/VIP	50%	50%
Media: journalists and photographers	78%	22%
Media: broadcasters	100%	0%
FIFA delegation and staff	100%	0%
PMAs	97%	3%
Referees	97%	3%
Tournament-time workforce and volunteers	51%	49%

The projections assume that some attendees from the Gulf Cooperation Council (GCC) countries will travel by road to Qatar. It is assumed in the calculations that most (91%) of these attendees will drive by car, while 9% will fly. The assumed origin of international attendees by region and their travel mode to and from Qatar are presented in Table 19.

Table 19: Expected travel mode and origin of attendees

Region of origin	Distribution	Air travel	Road travel
Qatar	26%	0%	100%
GCC countries	14%	64%	36%
Middle East	2%	100%	0%
Africa	5%	100%	0%
Europe	23%	100%	0%
North and Central America	9%	100%	0%
South America	10%	100%	0%
Asia	9%	100%	0%
Oceania	1%	100%	0%

An average distance of 6,580km one way was used to calculate the GHG impact of the flights for attendees.

The average distance was calculated based on ex post ticketing data from the 2018 FWC containing the general public's origins, with adapted travel distances to Qatar. It is the weighted average from 216 different origin airports, as presented in Table 20.

The split in short, medium and long haul for the emission factors is based on the same dataset as above, which was then calculated in the South Pole flight tool using distances between airports based on airport coordinates. The flight classes used for the different attendee categories were assumed to be the following:

- **Economy:** general public, 80% of hospitality attendees, media, tournament-time workforce and volunteers;
- **Business:** 20% of hospitality attendees, V/VIP, FIFA delegation and staff, referees; and
- **Chartered flights:** players and team officials.

Table 20: Average distance of attendee flights

Region of origin	No. of airports weighted	Weighted distance between origin & DOH (km)	% of total flights
GCC countries	6	573	13%
Middle East	5	1,496	3%
Africa	52	5,037	8%
Europe	63	4,960	34%
North and Central America	36	12,511	13%
South America	13	12,916	15%
Asia	25	5,055	13%
Oceania	15	11,135	2%
Weighted average	**2015**	**6,580.3**	**100%**

For intra-city travel, all attendees were assumed to travel an average distance of 63km per attendee and per day. This is based on the average distance between the different stadiums with the assumptions that each attendee makes two trips between stadiums per day and additional travel within the city of 20km per day. The average distribution per mode of transport is assumed to be 40% bus, 30% metro and 30% car.

For FIFA, SC and Q22 staff, PMAs and referees, there will be leased buses and cars for the intra-city transport. The assumption is that 90% of trips will be made by bus and 10% by car.

Test events: FIFA Club World Cup 2019 and 2020

The number and origin of attendees for the FCWC in 2019 and 2020 were estimated based on the ticket sales for the FCWC 2018.

Table 21: Attendee distribution for test events

Attendee category	Details	Numbers
General public	Individual tickets	89.9%
Hospitality		2.5%
V/VIP		1.1%
Media	International media National media	0.5% 0.1%
FIFA, SC and Q22 staff	FIFA delegation FIFA staff SC staff Q22 staff	0.4% 0.4% 1.1% 0.1%
Participating Teams	Players and team officials	1.3%
Referees		0.1%
Volunteers		2.6%

The region of origin for the attendees was based on the origin of the qualified teams and input from the tournament organisers on stadium capacities, expected match attendance and the projected split between international and domestic attendees. The split between international and domestic attendees per attendee category is presented in Table 22 and the distribution per region of origin is in Table 23.

Table 22: International or domestic origin of attendees for test events

Attendee category	International origin	Domestic origin
General public	34%	66%
Hospitality	34%	66%
V/VIP	34%	66%
Media	87%	13%
FIFA, SC and Q22 staff	39%	61%
Participating Teams	97%	3%
Referees	100%	0%
Volunteers	4%	96%

Table 23: Origin distribution of attendees for test events

Region of origin	Distribution	Air travel	Road travel
Qatar	66%	0%	100%
Europe	12%	100%	0%
Africa	4%	100%	0%
North and Central America	6%	100%	0%
South America	6%	100%	0%
Asia	3%	100%	0%
Oceania	3%	100%	0%

The distances for the international flights for the general public, hospitality, V/VIP and media were based on the distances between the origin cities of the teams that qualified for the FCWC 2019 and Doha. For the referees' and FIFA delegation flights, the same origins were assumed as for the FCWC in 2018.

The average distance for referee flights to Doha was calculated to be 4,756km, and the average distance for the FIFA delegation flights to Doha was 5,284km. The distances from the different regions for the other attendee categories are presented in Table 24.

Table 24: Average attendee flight distance for test events

Region of origin	Assumed origin airport	Distance between origin airport and DOH (km)	Haul length
Europe	LHR, England	5,240	Long haul
Africa	TUN, Tunisia	4,107	Long haul
North and Central America	MEX, Mexico	14,117	Long haul
South America	GRU, Brazil	11,853	Long haul
Asia	KWI, Kuwait	566	Medium haul
Oceania	NOU, New Caledonia	13,415	Long haul

The flight emissions were then calculated based on the origin split for all international attendees per attendee category. The flight classes used for the different attendee categories were assumed to be the following:

- **Economy:** general public, 80% of hospitality attendees, media and volunteers;
- **Business:** 20% of hospitality attendees, V/VIP, FIFA delegation and staff, referees; and
- **Chartered flights:** players and team officials.

For intra-city travel, all attendees were assumed to travel an average distance of 40km per attendee and per day. As for FWC match attendance, the average distribution per mode of transport was assumed to be 40% bus, 30% metro and 30% car.

Accommodation

The emission factors used for accommodation in Qatar are based on averaged data on emissions from the Cornell Hotel Sustainability Benchmarking (CHSB) Index 2019 per occupied room and night from the following hotel chains and their 12 hotels in Qatar: Hilton, Hyatt, InterContinental, Mandarin Oriental, Marriot and Wyndham.

The CHSB Index, a carbon emission factor database, usually contains emission factors per type of hotel and per star category. For Qatar, however, only the type of hotel is included. Deeper research showed that for the 12 hotels in Qatar, ten are 5-star, one is 4-star and one is 3-star. It is assumed that 4- to 5-star hotels are comparable to the CHSB Index full-service hotel category, and thus, the average emission factor for this class was used.

To obtain the emission factor for 2- to 3-star hotels, the average carbon intensity difference of these hotels' star ratings in the Middle East is used to calculate a figure based on the average of all hotels in Qatar (both limited and full service). For the "Other accommodation" category, applied for the tournament-time workforce, the emission factor with the lowest value of all hotel types and rooms in Qatar from the CHSB Index was used.

Two cruise ships will be used as additional, temporary accommodation for the general public. The cruise ship company provided data on the number of cabins and the expected CO_2e emissions per day at port. It was assumed that the ships will remain in port as accommodation for 46 days during the tournament phase.

FWC matches

Accommodation was only accounted for attendees arriving by international transportation for the different attendee categories. No accommodation was considered for domestic attendees as they are assumed to either stay at their homes in Qatar or with family and friends. For the general public and group sales customers, it is assumed that 80% will stay in paid accommodation and 20% will stay with family and friends regardless of origin, and thus no emissions were calculated for the latter. The accommodation type per attendee category is based on input from the tournament organisers, based on projections and available accommodation options in Qatar. The average guest nights and accommodation type per attendee category are presented in Table 25.

Table 25: Average guest nights per accommodation type

Attendee category	Average guest nights for international attendees	Accommodation type
General public	6	2-/3-star hotel Cruise ship
Hospitality	8	4-/5-star hotel
V/VIP	8	4-/5-star hotel
Media	45	4-/5-star hotel
FIFA staff	33	4-/5-star hotel
PMAs	51	4-/5-star hotel
Referees	50	4-/5-star hotel
FIFA and Q22 tournament-time workforce	33	2-/3-star hotel
Volunteers	33	Other accommodation
Host country workforce	40	Other accommodation

Test events: FIFA Club World Cup 2019 and 2020

Accommodation for the FCWC 2019 and the FCWC 2020 was accounted for all attendees arriving by international transportation. The accommodation type per attendee category is based on input from the tournament organisers, based on projections and available accommodation options in Qatar. The average guest nights and accommodation type per attendee category are presented in Table 26.

Table 26: Average guest nights per accommodation type for test events

Attendee category	Average guest nights	Accommodation type
General public	5	2-/3-star hotel
Hospitality	8	4-/5-star hotel
V/VIP	8	4-/5-star hotel
Media	8	4-/5-star hotel
FIFA, SC and Q22 staff	15	4-/5-star hotel
Participating Teams	12	4-/5-star hotel
Referees	18	4-/5-star hotel
Volunteers	15	2-/3-star hotel

Temporary facility construction and demounting

The data used for overlay and temporary construction are rough estimations, and several assumptions were made regarding product weights and material contents, based on research on the products and/or product types used.

The emission factors used are cradle-to-gate factors for materials and products taken from Ecoinvent and official Environmental Product Declarations (EPDs).

Stadium construction and demounting

The stadium construction was calculated according to the GHG Protocol: A Product Life Cycle Accounting and Reporting Standard, and the ISO 14040 Life Cycle Assessment Standard with a focus on climate impact. The stadium construction and operations emissions were allocated to the FWC 2022 emission inventory based on the stadiums' operational period of 46 days for the FWC and 12 days each for the two FCWCs. The materials and construction emissions from the stadiums' temporary infrastructure were fully allocated to the FWC 2022 emission calculation.

Material use

The data used for the emission calculation of the material use for the construction of stadiums was based on data collected and submitted for the Global Sustainability Assessment System certification of the stadiums. The data contained types of materials, their total weight and the distance that they would be freighted from their origin to the construction sites. The detailed raw material data was aggregated into material types that were then matched with material-specific cradle-to-gate life-cycle emission factors. The emission factors used were mainly taken from the Ecoinvent 3.6 database, but also from product-specific Environmental Product Declarations (EPDs).

Construction process

Data on fuel consumption, electricity use, water use and waste generation was used from the construction sites. This data was extrapolated to cover the full construction period for all stadiums.

Construction workers
In accordance with Qatari labour laws, a local employer is responsible for the recruitment of construction workers in their country of origin, for the provision of accommodation and food in Qatar, for travel between their accommodation and workplace, and finally, for repatriation. Although the SC is not their employer, as the contracting entity, it has put in place strong contracting and oversight mechanisms to ensure the safety and well-being of the construction workers on FWC sites, and thus the SC has direct access to the data required for the assessment of corresponding emissions. Given the SC's degree of operational control, it was decided to include emissions from construction workers' travel and accommodation as part of construction emissions. The SC provided the distribution of nationalities among workers and the workforce's average daily numbers from 2013 to 2019. For the stadiums that will be finished in 2020 or 2021, it was assumed that the number of daily workers per stadium would be the same for these years as for 2019.

For travel, it was assumed that all construction workers would travel to Doha on economy flights. For their accommodation, the lowest emission factor for hotels in desert climate zones from the CHSB Index 2019 was used.

Temporary infrastructure
The emissions from demountable upper tiers are calculated on actual data from the Al Janoub Stadium and multiplied for all other stadiums with demountable upper tiers. This was done by dividing the total emissions from that one upper tier by the total number of temporary seats within that stadium to create a specific emission factor per seat. This emission factor was applied to all other stadiums based on the number of temporary seats to calculate emissions from the other upper tiers based on their size. The emissions associated with energy use during construction, freight, water and dismantling activities were apportioned based on overall construction data.

Demounting
The demounting emissions were calculated for the Ras Abu Aboud Stadium, and an emission factor per seat was derived from that. This "demounting" emission factor was then applied to the remaining stadiums based on the number of temporary seats removed. It is assumed that the demounting emissions per seat will be the same for all stadiums.

Stadium operation
Data on estimated electricity, cooling and water use for the different stadiums was provided based on the different stadium design features. Data from an event at the finished Al Janoub Stadium was used to estimate the use of drinking water, the waste water discharge and waste generation.

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Impressum

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