International Olympic Committee

CARBON FOOTPRINT METHODOLOGY FOR THE OLYMPIC GAMES

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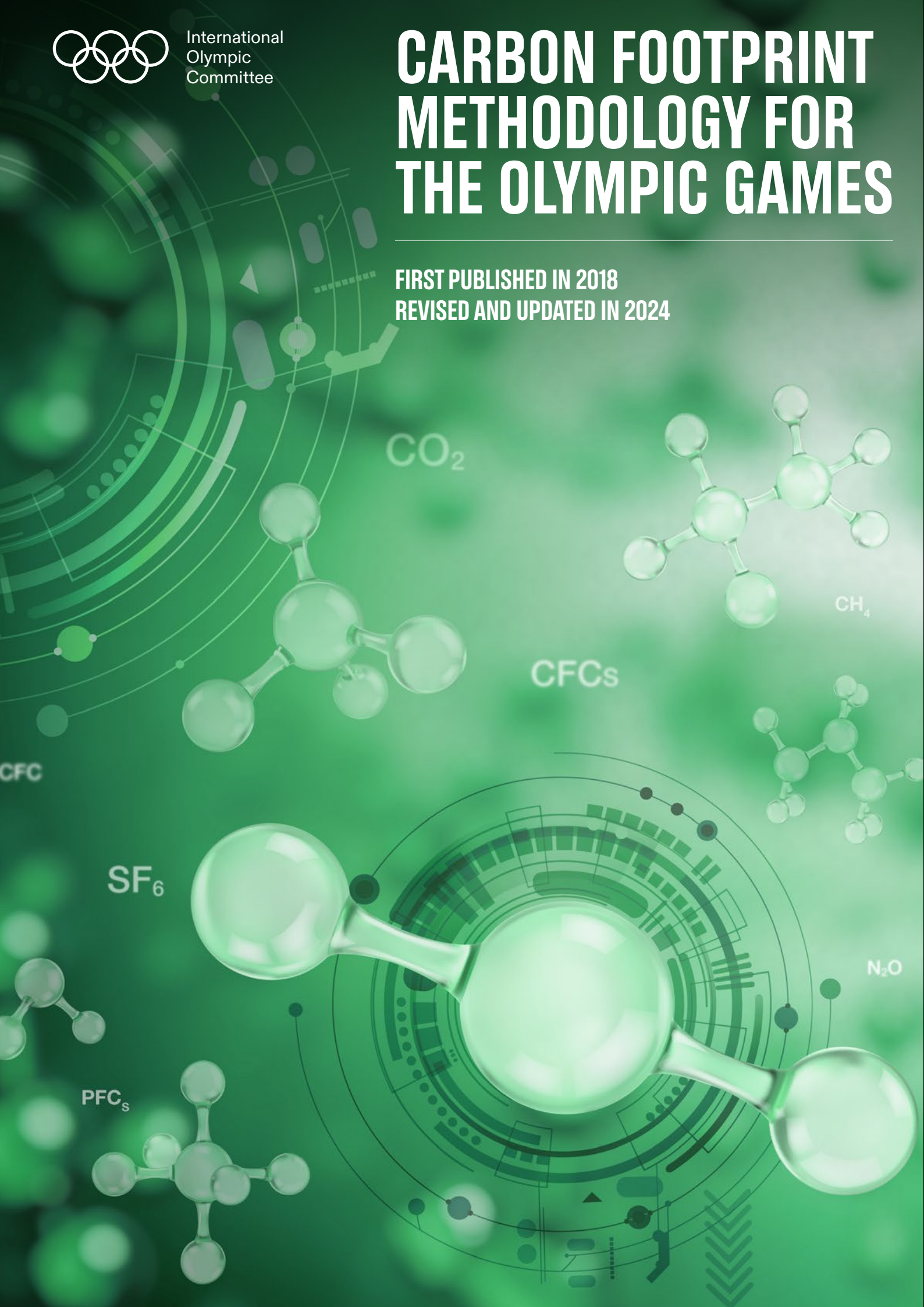

This methodology was originally issued by the IOC in December 2018, with technical content developed by Quantis, specialist consultants in sustainability. This second edition, published in 2024, draws upon advances in carbon footprinting methodology, experiences applying the methodology for recent Olympic and Paralympic Games, and specific feedback from the sustainability teams at Paris 2024 and LA28. It also reflects changes in the processes for electing future Olympic and Paralympic Games hosts. The technical content has been reviewed and updated with the help of Think Beyond consultancy.

The UN Climate Change Sports for Climate Action Framework welcomes this important initiative from the International Olympic Committee, which demonstrates its commitment to mobilising its stakeholders on their climate journey. Designed for the Olympic and Paralympic Games but relevant to other sports organisations, this methodology explains carbon footprint measurement and supports effective climate action planning, fostering sustainable practices across the sports sector.

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ACRONYMS AND ABBREVIATIONS

CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DEFRA	United Kingdom Department for Environment, Food and Rural Affairs
ELCD	European Reference Life Cycle Database
FA	Functional area (an organisational division within an OCOG
LCA	Life cycle assessment
IDEA	Inventory Database for Environmental Analysis
IBC	International Broadcast Centre
IF	International Federation
IT	Information technology
t	Metric tonne
GHG	Greenhouse gas
GWP	Global warming potential
IOC	International Olympic Committee
kg	Kilogram
km	Kilometre
MPC	Main Press Centre
N_2O	Nitrous oxide
NGO	Non-governmental organisation
NOC	National Olympic Committee
NPC	National Paralympic Committee
O_3	Ozone
OBS	Olympic Broadcasting Services SA (also OBS SA)
OCOG	Organising Committee for the Olympic Games and Paralympic Games
OECD	Organisation for Economic Co-operation and Development
OTR	Olympic Torch Relay
person.km	Person multiplied by kilometre (personal transport unit)
PTR	Paralympic Torch Relay
SDGs	Sustainable Development Goals
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

TERMINOLOGY AND DEFINITIONS

Additionality	GHG reductions or removals that would not have occurred in the absence of the associated policy interventions or activities.
Carbon footprint	The actual amount of GHG emissions of a given system, project or organisation, typically measured in tonnes of carbon dioxide equivalent (CO_2e). Also *GHG inventory*. See also *carbon footprinting*.
– Initial carbon footprint	The first measure of the Games' GHG emissions. This indicative carbon footprint will be compiled during the Targeted Dialogue phase. It will be revisited and undergo several iterations during the Games' planning phase as plans are developed and refined – see below.
– Reference carbon footprint	The second measure of the Games' GHG emissions. It is the first revisit of the *initial carbon footprint*, undertaken early in the OCOG's strategic planning phase to provide a more comprehensive baseline.
– Revised carbon footprint	The third measure of the Games' GHG emissions. It should be calculated in the Games' planning phase as operational details become better defined and suppliers across key emission sources are in place and onboarded. The purpose is to refine accuracy, enabling more precise interventions to limit GHG emissions leading up to the Games.
– Actual carbon footprint	The fourth and final measure of the Games' GHG emissions, completed after the Games and largely based on monitored data.
Carbon footprint boundary	The defined scope and limitations of what is and isn't included when calculating the Games' *carbon footprint*: the types of emissions (direct and indirect), the Games' geographical boundaries, the time period covered by the Games, and which specific activities should be included or excluded.
Carbon footprinting	The process of measuring the *carbon footprint* of a given system, project or organisation.
Climate action plan	A plan that covers the whole Games programme, setting out objectives, action areas and targets for avoiding and/or reducing GHG emissions, removing carbon from the atmosphere and inspiring climate action among stakeholders.
Data owners	Responsible persons within OCOGs or external organisations who have access to the data needed to calculate the Games' *carbon footprint*.
Emission factor	The GHG emission factor of a specific activity or product represents the sum of all the GHG emissions to air related to this activity or product, which is then converted to kilograms of carbon dioxide equivalent (CO_2e). These factors are usually available in different databases. The data translated to GHG emissions, using the emission factors, can be summed up, and the results of the carbon footprint are then expressed in kilograms or tonnes of CO_2e ($kgCO_2e$ or tCO_2e).
Games delivery partners	Organisations that work hand in hand with the OCOG to deliver the Games. They usually include host authorities, transport agencies and the organisation in charge of delivering permanent infrastructure for the Games (e.g. SOLIDEO for the Olympic Games Paris 2024).
Life cycle assessment (LCA)	The process of evaluating the effects of a product, material, process or event on the environment over its entire life.
OCOG workforce	OCOG staff, volunteers and contractors.
Olympic Movement	All individuals and entities who are inspired by the values of Olympism. The Olympic Movement is composed of three main constituents – the International Olympic Committee (IOC), the International Federations (IFs) and the National Olympic Committees (NOCs) – along with other organisations that recognise the IOC's authority, including the Organising Committees for the Olympic Games and Paralympic Games (OCOGs), the athletes, judges and referees, national associations and clubs, and other IOC-recognised organisations and institutions.

Overlay	Additional infrastructure, installations and equipment added to an existing, new or temporary venue to make it "Games-ready". The term is also frequently applied to describe a complete "turnkey" reusable venue or facility solution.
Primary data	Data directly measured and collected by the OCOG and its partners/suppliers. By definition, primary data have a high level of quality. See also *secondary data*.
Science-based emissions reduction target	An emissions reduction target is defined as "science-based" if it is in line with the scale of reductions required to keep global temperature increase to 1.5°C above pre-industrial temperatures.
Secondary data	Data that the OCOG is unable to collect directly and that must be estimated by other means (e.g. assumptions, literature reviews, case studies, expert judgements, etc.). See also *primary data*.
Sensitivity analyses	The GHG emissions reduction potential of the different measures that are calculated using the carbon footprint methodology.
Sponsors	Worldwide Olympic Partners, which are the partners of the IOC, and domestic marketing partners, which partner with individual OCOGs for each edition of the Games.
Technical officials	Individuals who control and manage the play of a sporting competition and ensure all rules are followed. They are appointed by IFs for each edition of the Olympic and Paralympic Games.
Validation	The process for evaluating the reasonableness of assumptions, limitations and methods that support a statement about the outcome of future activities. It involves reviewing data sources, methodologies and assumptions used in calculating emissions that are appropriate and reliable.
Verification	The process for evaluating a statement of historical data and information to determine if it is materially correct and conforms to specific criteria.

1 INTRODUCTION

1.1 Context and background

Climate is one of five focus areas specified in the IOC's Sustainability Strategy (approved by the IOC Executive Board in December 2016). It addresses our long-term strategic intent for 2030: that effective carbon avoidance and reduction strategies are in place for operations and events, and that they are aligned with the objectives of the Paris Agreement on climate change (drafted in 2015, signed in 2016). Our strategy also requires that adaptation to the consequences of climate change is taken into account in the planning of sports facilities and events[1].

In 2021, the IOC announced that editions of the Olympic Games from 2030 onwards must have a focused approach to climate action covering three key areas:

- Minimising greenhouse gas (GHG) emissions as much as possible.
- Removing more than 100 per cent of residual emissions from the atmosphere.
- Using influence among Games delivery partners to create climate action.

This is referenced in the IOC Olympic Host Contract – Operational Requirements (October 2022, with addendum), which specifies the following requirements on the theme of climate:

SIL 14 – Greenhouse Gas (GHG) Inventory and climate action plan

- "In collaboration with the IOC and Host Country Authorities, establish a baseline GHG Inventory [now termed 'reference GHG inventory' in this methodology] for the Games project, encompassing both direct and indirect emissions, using the IOC's Carbon Footprint Methodology for the Olympic and Paralympic Games. This shall update the initial estimated footprint calculated pre-election.
- In collaboration with the IOC and Host Country Authorities develop and publish a detailed climate Action Plan that will outline the following:

  a. the actions to minimise direct and indirect Games related GHG emissions;

  b. the actions aiming at removing more GHG emissions from the atmosphere than what the Games project emits;

  c. the actions to encourage stakeholders to take climate action;

  d. the measuring and monitoring system to track GHG emissions;

  e. any climate adaptation measures put in place for the Games;

  f. the breakdown and details of the [reference] GHG emissions and revised GHG emissions.

Submit the GHG inventory and climate action plan to the IOC for final comments and approval prior to publication."

As indicated in the first point in SIL 14 above, there is now a requirement for potential Games hosts to carry out carbon-related work before future host elections, as per the Future Host Questionnaire.

Targeted Dialogue
As part of the process for electing future Olympic and Paralympic Games hosts, a country that expresses an interest in hosting the Games ("Interested Party") may eventually be designated a "Preferred Host" by the IOC. The Preferred Host then enters into exclusive discussions about hosting the Games with the IOC, a process known as "Targeted Dialogue".

Preferred Hosts are required to present key information and make important commitments to the IOC across a variety of topics, including sustainability, during the Targeted Dialogue phase. As part of this process, they must provide the IOC with the following information:

- An initial estimate of the carbon footprint (GHG inventory) of the Games project using the IOC's Carbon Footprint Methodology for the Olympic Games.
- A proposed carbon budget for the Games, according to science-based emissions reductions in line with the Paris Agreement.
- A description of how they would develop a carbon management strategy to measure, minimise, manage and mitigate the impacts of GHG emissions during Games preparation and at Games time.

These requirements will ensure that the potential to minimise direct and indirect Games-related GHG emissions is fully understood before each future host election. It will also enable climate impacts to be factored into all strategic decision-making from the outset, such as early decisions relating to venue types, location and design, and legacy planning.

Detailed compilation of the carbon footprint is not required before the future host election, but Preferred Hosts must establish an indicative version – known as the "initial carbon footprint" – upon which to base their carbon budget for the Games.

The initial carbon footprint and carbon management strategy confirming respect of the proposed carbon budget must be submitted to the IOC for review and third-party validation as part of the responses to the IOC's Future Host Questionnaire.

1.2 Purpose of this document

This guide has been developed to assist and facilitate Preferred Hosts and OCOGs in addressing the carbon-related requirements

1 For further details on the rationale for climate as a sustainability focus area, please refer to the IOC Sustainability Strategy: https://olympics.com/ioc/sustainability

of the Targeted Dialogue phase of electing future Games hosts, and the measuring part of SIL 14 in the IOC Olympic Host Contract – Operational Requirements.

The fundamental purpose is to provide a tool to help Preferred Hosts and OCOGs to make effective decisions that avoid or reduce the potential negative climate impacts of the Games. This guide focuses on the methodology for carbon footprinting, but it is not a guide on how to reduce carbon emissions.

Since the mid-2000s, it has become standard practice for OCOGs to measure the carbon footprint of their respective Olympic and Paralympic Games projects. However, the methodologies used by OCOGs have been inconsistent, which lessens the transfer of knowledge potential from one Games to another, as well as causing successive OCOGs to start from scratch. Furthermore, the timing and application of the carbon footprint data – often too late in the Games-planning cycle – have lessened their effectiveness in terms of achieving a significant lowering of GHG emissions.

While it is clearly desirable to have a reliable quantitative basis for developing a climate action plan early in the Games planning cycle, the challenge is that the organisational maturity of the OCOG is usually not sufficiently developed to do this. Even when an in-house sustainability team is established early in the OCOG life cycle, it is likely to lack capacity, resources or expertise to undertake a carbon footprint calculation. It takes time to understand who does what, who owns which data and how best to influence early decision-making.

This document is therefore intended to help shorten the inevitable learning curve by providing Preferred Hosts and OCOGs with detailed guidance on how to measure the carbon footprint of their Games project. This will help reduce early workloads and speed up the process of developing an effective climate action plan.

More specifically, the guide has three objectives:

- to present the carbon footprint methodology and its application to the Games;
- to ensure consistently high-quality carbon footprinting by OCOGs; and
- to ensure clear, accurate and relevant communication and reporting.

It is also hoped that this methodology will facilitate better transfer of knowledge between successive OCOGs. It is not meant to be used to compare carbon footprints from Games to Games – there are too many variables to make any such comparison meaningful.

1.3 Intended audience

This guide is primarily aimed at sustainability specialists and/or sustainability staff working with or within Preferred Hosts, OCOGs and the internal and external stakeholders that will play an important role in collecting data, calculating the Games' carbon footprint and monitoring results. They may include public and private delivery partners responsible for any Games-related venues and infrastructure, specialist consultants, expert advisory groups and assurance bodies.

Other event organisers wanting to measure the carbon footprint of their event may also find the content useful.

1.4 Process for developing the methodology

This guide has been produced by the IOC. For the first edition, published in December 2018, specialist consultants Quantis International[2] were commissioned to develop and draft the methodology, which was reviewed by IOC advisors and other subject matter experts. Consultees included sustainability team members from various OCOGs.

This updated and revised edition has followed a similar process by drawing on detailed feedback from the OCOGs for Paris 2024 and LA28, with Think Beyond[3] appointed as specialist consultants.

1.5 How to use this guide

This guide aims to provide a comprehensive resource to support the process for measuring the carbon footprint of the *Olympic and Paralympic Games*. It is relevant to both *Summer and Winter editions of the Games*.

It is designed to be used primarily as a reference manual to be consulted for specific information, rather than to be read from cover to cover. However, we do recommend reading chapters 2 to 5 before referring to the more technical sections of chapters 6 to 9.

Please note: If you are uncertain about anything within this guide, wish to discuss any specific subjects or seek clarifications, please contact the IOC.

1.6 Feedback

As part of our commitment to continuous improvement, we welcome feedback both from practitioners who have utilised the guide and from subject-matter experts and other interested parties, with a view to improving future editions. If you do not have a direct relevant contact at the IOC, please send any questions and/or comments to sustainability@olympic.org.

2 Quantis International: www.quantis-intl.com
3 Think Beyond: www.thinkbeyond.consulting

2 METHODOLOGICAL PRINCIPLES

2.1 Greenhouse gases (GHGs)

Most GHGs are naturally present in the atmosphere. However, since the Industrial Revolution, their concentrations have increased exponentially through man-made processes. They have now reached levels that threaten the stability of climate patterns, hence the common terms "global warming" and "climate change". The main source of GHG emissions is the combustion of fossil fuels (oil, coal and natural gas). Agriculture, deforestation and refrigerant fluid leaks are also important sources.

Each GHG is characterised by its global warming potential (GWP), which is determined by the greenhouse effect and its lifetime in the atmosphere. Carbon dioxide (CO_2) is by far the main contributor to global warming, accounting for about 75 per cent of GHG emissions. As a result, the global warming potential of GHGs is measured relative to the mass of CO_2 and are thus expressed as CO_2 equivalent (CO_2e).

The most common anthropogenic GHGs are listed below in Table 1.

2.2 Carbon footprinting: The basics

A carbon footprint measures total GHG emissions caused directly and indirectly by a person, organisation, service or product within the carbon footprint boundary.

Although often referred to as a "carbon footprint", it is typically measured in carbon dioxide equivalent (CO_2e), which includes and standardises the impact of various GHGs in light of their different GWPs. Therefore, a carbon footprint measured in CO_2e refers to and also includes various other GHGs, not just carbon dioxide. The list of GHGs is included in the IPCC Fifth Assessment Report[4].

The Games' carbon footprint should include, when possible, all GHGs listed in the IPCC Fifth Assessment Report. However, for the sake of pragmatism, and as carbon footprint tools and software do not include all GHGs listed by the IPCC, the Games' carbon footprint must include at least the three most common GHGs: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). The measure should be expressed in $kgCO_2e$ (kilograms of carbon dioxide equivalent) or tCO_2e (tonnes of carbon dioxide equivalent).

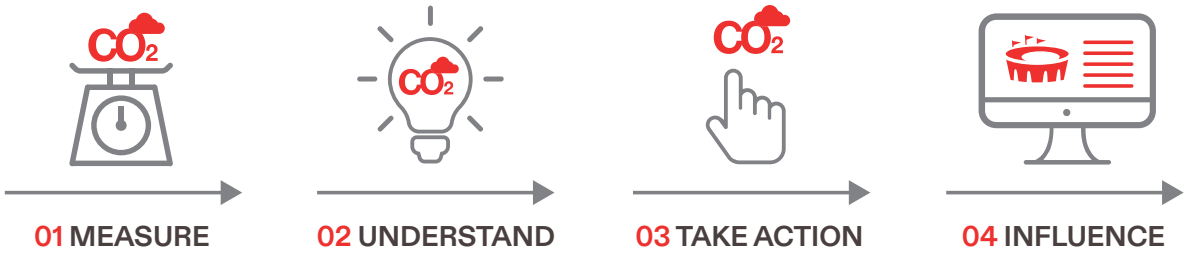
TABLE 1: MAIN GREENHOUSE GASES

Main GHG	Chemical formula	Evolution of troposphere concentration since 1750	GWP 100 years (conversion factor)*	Contribution to climate change*
Carbon dioxide	CO_2	+40%	1	76%
Methane	CH_4	+150%	28	16%
Nitrous oxide	N_2O	+20%	298	6%
Artificial gas	Sulphur hexafluoride (SF_6), chlorofluorocarbons (CFCs), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs)	N/A	Variable	2%

Source: Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, 2014

4 https://www.ipcc.ch/report/ar6/syr/

FIGURE 1: CARBON FOOTPRINTING – THE FIRST STAGE OF A FOUR-STAGE PROCESS



2.3 Rationale for carbon footprinting

Carbon footprinting is a measurement process that identifies opportunities to avoid and reduce negative environmental impacts, and to improve performance. The results can be used both to support decision-making and to enhance the credibility of marketing and communication efforts on sustainability, as they will be backed by factual information. It is therefore important that a Games' carbon footprint reflects the changing state of operations and activities throughout the Games project, such as changes in workforce count, the number and types of facilities occupied, and total activities across the life cycle of the Games.

In this way, carbon footprinting can be viewed as the first stage of a four-stage process, as illustrated in Figure 1.

1. **Measure**
   Carbon footprinting consists of measuring GHG emissions of the organisation, service or product being assessed. It produces a robust quantitative evaluation of a key aspect of your environmental impacts.

2. **Understand**
   The measurement is necessary to evaluate the overall climate impacts of the organisation, service or product, and to understand which activities contribute the most to these impacts, which contribute less, and which parameters influence the impacts of these different activities.

3. **Take action**
   Understanding the most significant activities is key when guiding decision-makers to take actions that will reduce your GHG inventory, both through avoidance measures and through emission reductions. The top priority should be to focus on activities that have the highest contribution to the carbon footprint. The potential effectiveness of avoidance and reduction measures can also be assessed using the carbon footprint methodology. This will help to select the most cost-effective actions with the highest avoidance or reduction potential.

4. **Influence**
   By clearly communicating carbon objectives and results, the OCOG is then in a position to influence stakeholders to take climate action.

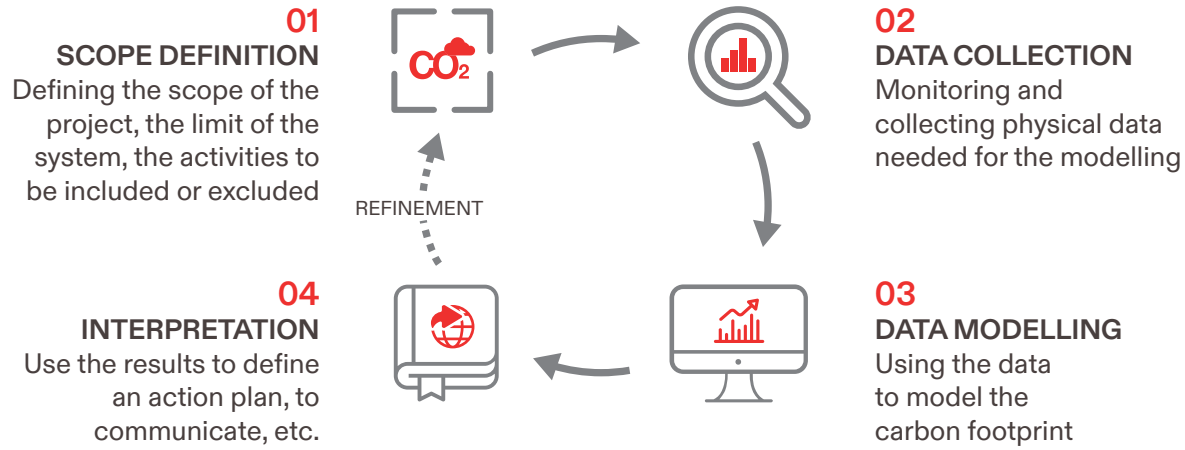
2.4 Key elements of carbon footprinting

Carbon footprinting has four key steps, as seen below in Figure 2.

1. **Scope definition**
   The reasons for calculating the carbon footprint are set out, as are the system boundaries (i.e. the processes, potential assumptions and limitations to be included in the assessment).

2. **Data collection**
   The data and information relating to the organisation, product or service being studied are collected from different sources. Typical data to collect include raw materials used, water and energy consumption, transportation modes and distances, waste generation and treatment.

FIGURE 2: THE FOUR KEY ELEMENTS OF CARBON FOOTPRINTING



3. **Data modelling**
   The data collected in the previous step are "translated" to GHG emissions, based on emission factors, per unit of input (e.g. expressed in $kgCO_2e$/unit of input).

4. **Interpretation**
   Based on the results, activities that contribute most to the total carbon footprint can be identified.
   - The data relating to these contributing activities are the top priority for refinement and improvement of the assessment.
   - In turn, this leads to the identification of priority actions for minimising the carbon footprint.
   - Results are also used for communication and reporting.

Always keep in mind that calculating and assessing a carbon footprint is an iterative process that will be done several times.

A first version, or initial carbon footprint, will be developed during the Targeted Dialogue phase. Effectively a simple screening exercise based on assumptions and/or rough estimations for missing data, it is essential for identifying the main contributors to the total carbon footprint, and in turn selecting the top priority data to refine. This first stage is also key to understanding data gaps or where data quality is poor (see section 4.2.3). This initial carbon footprint will be revisited early in the OCOG's strategic planning phase to provide a more comprehensive reference carbon footprint.

Data quality can be very variable. Ideally, the carbon footprint should be compiled from real measurements, but typically, one will have to make assumptions and estimates, and use proxy indicators in the absence of direct values. Particularly in the early stages, there may be significant gaps in information about venue designs, levels of services, numbers of people involved, etc.

Successive iterations will lead to a refinement of the calculated carbon footprint, using higher-quality data for the most significant activities. These iterations are necessary to improve the accuracy of the results.

More detailed information on each of these key elements is given in chapter 4.

2.5 A carbon footprint methodology specific to the Games

As explained above, carbon footprinting is normally applied to organisations, products or services. The Games is a singular large-scale project that contains elements of each, and usually involves multiple public and private organisations. These "Games delivery partners" typically include city authorities, transport agencies, national government departments and specific organisations established to build venues and infrastructure for the Games. Therefore, we have developed this carbon footprint methodology to take account of the special circumstances of the Games as a project.

2.5.1 The Games as a project

Measuring the carbon footprint of the Games presents particular challenges.

It is a future event

While the event is some years in the future, the carbon footprinting work must be initiated early, both before the Games host city/region has been confirmed and then during the planning phase. Typical permanent organisations present their carbon footprints as factual retrospective accounts of what they have done during a given reporting period, and use them to help set future targets. For the Games, though, the nature of the carbon footprinting work is often a forward-looking estimation of anticipated impacts.

Aside from any Games-related construction projects in the early years, the vast majority of carbon emissions will occur in the year of the Games. This means that the carbon footprinting exercise is essentially a form of impact assessment all the way up to Games time and only afterwards does the final calculation become a report on actual emissions.

Lack of high-quality data at the beginning may impact the accuracy of the initial carbon footprint exercise, but despite this it should be useful to highlight potential areas where GHG emissions could be avoided or reduced, so that these can be taken into consideration in decision-making processes.

It relies on a complex network of Games delivery partners

Delivering the Games requires input from multiple organisations, and so responsibility for some of the major sources of GHG emissions will be shared by more than one entity. This can present specific challenges in terms of defining scope and allocating responsibilities.

The OCOG is the lead organisation in terms of planning and staging the Games, and this guide is focused on the OCOG being responsible both for the carbon footprint calculation and for the development of the Games' climate action plan. However, key elements of the project will often be managed by public agencies and/or private developers, and it is important to be able to capture GHG emissions caused by these activities.

One Games, different levels of control – where to draw the boundary?

There are many potential sources of GHG emissions that would only have occurred because of the Games, but over which the organisers have little control and varying degrees of influence – for example, spectator travel and accommodation. GHG emissions for these items are often hard to calculate because of the difficulty in obtaining reliable data, and because such data are often only available several months after the Games. Nevertheless, they are a factor in the delivery of the Games, and therefore must be taken into consideration. Figure 3 shows an indicative carbon footprint of a Games cycle, split by sphere of activity and sphere of ownership.

There are also sources of GHG emissions for which it is often unclear if they are truly Games-related (i.e. necessary for staging the Games) or if they have been brought forward to take advantage of hosting the Games but would have happened in any case at some point in the future. An example here is the upgrading of city infrastructure, such as venues, telecoms and transport systems. It is therefore crucially important to define what is included in the boundary of the Games' carbon footprint and who owns (i.e. is responsible for) these emissions.

In parallel with the carbon footprinting exercise, there are economic impact assessments on the Games (required by the IOC), and it is important to ensure there is alignment between the two studies regarding what is included and excluded in both.

Any new infrastructure to be used for the Games that is already part of a planned and approved development irrespective of the Games, and which is either under construction or scheduled to be completed and in normal operation well in advance of the Games, should be counted as "Planned infrastructure", and its construction should not be included in the Games' carbon footprint. For more detail relating to types of permanent infrastructure projects, see section 7.2.

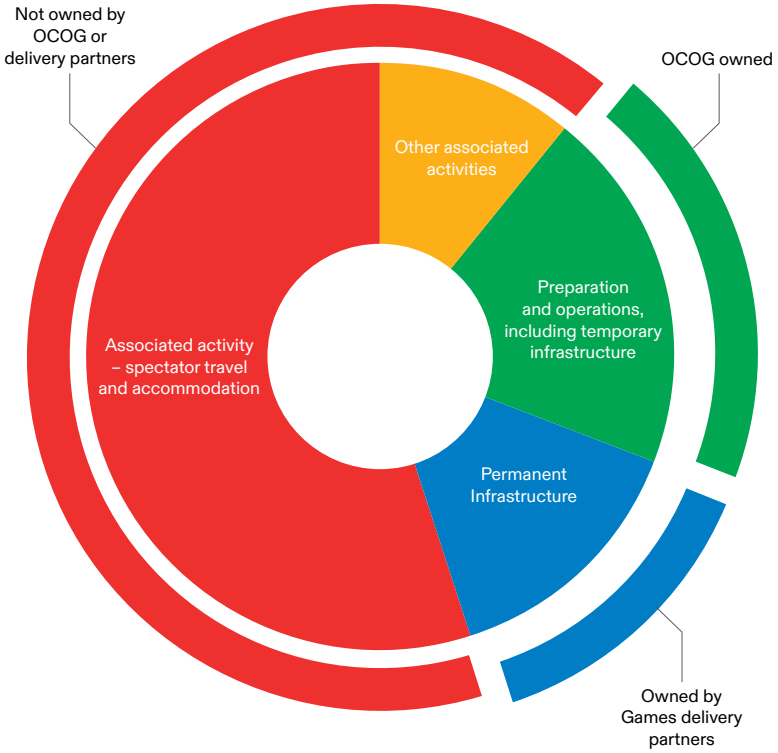
Another example relates to GHG emissions due to the Games-related activities of commercial partners (sponsors), National Olympic Committees (NOCs)/National Paralympic Committees (NPCs) and International Federations (IFs), as well as broadcasters and the IOC's own activities (including those of Olympic Broadcasting Services (OBS)). These emissions are the responsibility of each of these organisations. However, they must still be captured within the Games' carbon footprint even though they are not owned by the OCOG. Wherever possible, the OCOG should engage with these entities to influence their own carbon reduction initiatives, and encourage them to measure their Games-related carbon footprints and share the results.

There are internal and external perspectives

What is most important from the perspective of external stakeholders, notably non-governmental organisations (NGOs), media and the general public, is that as accurate as possible a picture of GHG emissions relating to the Games project is provided. Stakeholders are not interested in the minutiae of organisational divisions of responsibility. Whether they are down to the OCOG or a Games delivery partner, GHG emissions will be associated with the Games. Therefore, the Games' carbon footprint must be presented externally in the context of the Games, not of individual organisations, even though internally there should be clear allocations of responsibility.

This guide aims to support the navigation of these challenges by providing an outline of key principles and guidelines relating to defining the Games' carbon footprint boundary and data quality (see chapter 4), and to reporting (see chapter 5).

FIGURE 3: INDICATIVE CARBON FOOTPRINT OF THE GAMES, SPLIT BY SPHERE OF ACTIVITY AND SPHERE OF OWNERSHIP (EXACT SPLIT WILL VARY)



2.5.2 Compliance with internationally recognised standards

Carbon footprinting is an internationally recognised methodology, and various standards exist for its application to products, services and organisations. The methodology proposed in this guide is inspired by and consistent with existing international standards: the GHG Protocol, ISO 14064 and the European Commission's Organisation Environmental Footprint (OEF).

These widely used standards are aimed at guiding organisations' carbon footprint calculations. However, as they were not developed with sports events in mind, they are not necessarily well adapted for this purpose. As a result, we have based the methodology presented in this guide on the principles of these standards, but with specific adaptations for the Games.

These principles are explained in Table 2 (left hand column).

For further information beyond the detail of this guide, please refer back to these international standards and their underpinning principles.

2.5.3 Legacy

There is much attention these days on Games' legacies, in terms of lasting environmental, social, sporting, cultural and economic benefits arising from having hosted the Games. In carbon accounting terms, legacy benefits are lasting carbon savings as a result of Games-funded projects or initiatives. To count towards legacy, they must be additional (see section 2.5.4).

Unless there is a long-term programme after the Games to measure legacy carbon savings, the information is likely to be lost. Therefore, in establishing legacy programmes where there might reasonably be carbon savings, organisers should incorporate requirements and methodologies to enable this information to be captured during the implementation phase of the relevant programmes.

2.5.4 Additionality

Due to the size and scale of the Olympic and Paralympic Games, along with its complex stakeholder landscape, the Games permeates through the host city/region, host country and indeed the world. Consequently, there can be confusion as to what truly relates to the Games as additional activity, and what may already exist or be planned but becomes absorbed into the Games narrative.

TABLE 2: CARBON FOOTPRINT PRINCIPLES (SOURCE: GHG PROTOCOL)

Principle	Definition
Relevance	Ensure the GHG inventory appropriately reflects the GHG emissions of the Games, and serves internal and external decision-making processes. Identify any contentious carbon accounting issues early to allow time for research, debate and consensus-building. Document the decision-making process.[5]
Completeness	Account for and report on all GHG emission sources and activities within the chosen inventory boundary and in the year that the emissions occur. Disclose and justify any specific exclusion(s).
Consistency	Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods or any other relevant factors in the time series.
Accuracy	Ensure that the quantification of GHG emissions is based on reasonable assumptions and that uncertainties are reduced as much as possible. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance with respect to the integrity of the reported information.
Transparency	Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies, assumptions and data sources.

5 The carbon emission factors used should be responsive to local circumstances. Rules about how to account, for example, renewable energy are not universal. They can change as new guidance emerges, and may differ within and between countries.

Such questions of additionality are complex and can lead to considerable debate with stakeholders and subject matter experts. For example, the creation of green spaces and reforestation projects might be attributed as Games-related – but if they were pre-planned and funded from entirely different sources, it would not be permissible for the Games' organisers to claim the carbon benefits.

The golden rule is to be clear and strict about what is within the boundary of the Games' carbon footprint, and equally to be rigorous in determining genuine additionality for any activity or carbon benefits being claimed (see Table 2).

2.5.5 Keeping the main purpose in mind

Carbon accounting is a technical discipline. In a project as complex as the Games, with such a wide scope, multiple Games delivery partners and a long timeframe, it would be easy to become lost in minute details.

It is therefore always important to remember the real purpose of this exercise. It is about avoiding (where possible) and minimising GHG emissions caused by planning and staging the Games, and the carbon footprint is intended to be a tool to facilitate decision-making for this purpose. It is not an academic exercise to measure every gram of carbon that might have some tangential relationship to the Games. Pragmatism and practicalities should outweigh purity of accounting, and a case-by-case approach should be followed.

Given resource and time constraints, there must be a pragmatic balance between achieving technical accuracy and the practical ability to avoid and minimise GHG emissions.

What is important, therefore, is to ensure that boundaries are very clearly stated, and any potentially controversial exclusions are transparently justified and explained in documentation. In case of doubt and to ensure consistency, please discuss with the IOC.

3 CALCULATING THE GAMES' CARBON FOOTPRINT: ORGANISATIONAL ASPECTS

This chapter explains how the carbon footprint of the Games should be calculated and used to develop a climate action plan. The technical aspects of the carbon footprint calculation are addressed in chapters 4, 7, 8 and 9.

3.1 Key steps for developing the Games' carbon footprint

The carbon footprint calculations form the "measure" part of the sequence set out in section 2.3. However, it is not a single, one-off measurement, but is part of an iterative process that is integral to fulfilling the requirement for a climate action plan.

This iterative process may have several intermediate stages, but the essential components and the strategic actions they enable are illustrated and described below in Figure 4.

3.1.1 Initial carbon footprint

The initial carbon footprint is a requirement for the Targeted Dialogue phase explained in section 1.1. Its primary function is to serve as an initial screening exercise to identify potential climate impact risks and to guide the early concept development for the Games.

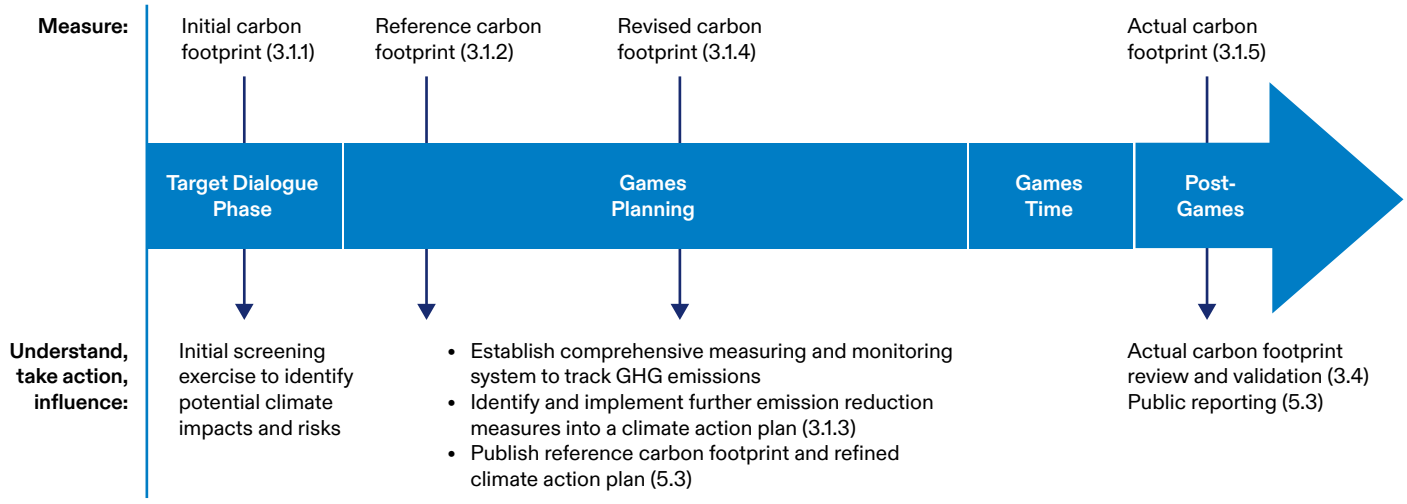
The methodology presented here should be followed, while recognising at this early stage the exercise will have limitations and should be viewed simply as a basic estimate focusing on the primary elements of the Games project.

3.1.2 Reference carbon footprint

The initial carbon footprint will be updated to a reference carbon footprint. This will be the first iteration of the carbon footprint by the OCOG, and should be carried out as early as possible in the Games strategic planning phase to provide a basis for informing key decisions.

At this stage the calculations will obviously be based on forecasts rather than actual results (ex-ante). In addition to providing a first estimate of GHG emissions following the Games host election, this will serve three other purposes:

FIGURE 4: CARBON FOOTPRINT MEASUREMENT AND MANAGEMENT OVERVIEW



- Identifying which data should be prioritised for future iterations of the carbon footprint.
- Defining internal responsibilities and organisational processes to monitor and collect such data.
- Providing information needed to develop the climate action plan.

An explanation of how to use the reference carbon footprint results is detailed in section 4.4.

It is likely that it will require a good year to 18 months to identify data requirements and sources, pull together expert teams, complete the calculations and obtain management and delivery partner approvals.

Nevertheless, it is preferable to have an early estimate, albeit with caveats on data quality and gaps, rather than leave it too late because of an obsession with technical accuracy or a nervousness to act early. Subsequent iterations can modify the carbon footprint, as new and better data become available.

3.1.2.1 Method and data

Some GHG emissions can be calculated based on activities that are already occurring, such as those relating to energy use at the OCOG's headquarters or staff travel, although they will be negligible compared with Games-time GHG emissions. At this stage, most emissions can only be estimated as they are based on activities that will occur in the future, such as catering and transport services during the Games.

The reference carbon footprint must therefore be based on information and data from the initial carbon footprint created during the Targeted Dialogue phase, OCOG planning documents, budgets and reference cases, such as previous Games and other studies on venues, events and other projects in the host country or region. It will be important to engage closely with the finance department, so that budgetary details for each relevant functional area (FA) are available.

The reference carbon footprint should normally be calculated based on the Games' concept at the time of being elected host. Where carbon-saving measures have already been included in the Future Host Questionnaire (from the Targeted Dialogue phase), they should be considered as your starting point – i.e. it would be wrong to claim them again later as new carbon-saving initiatives in a climate action plan.

If there have been some alterations of venues to be used for the Games and/or new sports have been included that require different venues, the reference carbon footprint should reflect as best possible the Games' current masterplan.

It may be of interest to show the carbon impact of venue changes from the initial concept to an optimised masterplan – usually driven by cost savings, operational efficiencies and legacy concerns, but equally importantly by sustainability measures.

This does not exclude the potential for further venue alterations later in the planning phase (including for new sports), but they should take climate impacts into account as part of the decision-making process. Where such changes occur, they should be captured in future iterations of the carbon footprint and the effect of such changes should be clearly stated.

3.1.2.2 Outcome

- **Project management plan.** The knowledge acquired throughout the process of the first carbon footprint calculations will help towards the development of subsequent phases of the project.

  An internal project management plan should be prepared to define the following:
  - Resources required: budget and staffing (see section 3.2).
  - Project governance: naming of a person in charge of organising the data collection; this person will connect with each data owner, including those outside of the OCOG.
  - Schedule: defining a timeline for data collection (including for emissions occurring during the planning stage) and reporting.
  - Processes and technical requirements: organising the data collection (types of data, tools, methods, quality control, data owners).

This work will drive the expected level of quality through the rest of the carbon footprinting exercise.

3.1.3 Climate action plan

While the carbon footprint is a measurement exercise, its application is fundamental to delivering the OCOG's sustainability goals and taking action on the Games' climate impacts.

The scope of the climate action plan should include the activities under the direct control of the OCOG and those of other delivery bodies and partners on whom the OCOG may exert a direct or indirect influence.

Identifying potential emission avoidance and reduction opportunities is a continual process that goes hand-in-hand with successive iterations of the carbon footprint. When identifying these opportunities, it is important to ensure additionality (see section 2.5.4).

The climate action plan should also outline how the OCOG aims to increase awareness and inspire climate action among stakeholders. It should also consider measures of the OCOG plans to respond to the impact of the climate on the Games, e.g. the effects of extreme weather events.

3.1.3.1 Content

The climate action plan should draw on the findings from the reference carbon footprint to identify and set targets for carbon saving opportunities, especially regarding venue design, materials selection, procurement strategies and initial plans for Games operations.

There are many variables to consider, so the plan is likely to include a range of scenarios offering different levels of carbon reduction potential. These should be evaluated in order to select the scenarios that have the most cost-effective potential for achieving carbon reduction targets.

The development of the climate action plan should be the responsibility of the OCOG's sustainability team, working alongside other functional areas[6] (FAs) and with counterparts on other delivery bodies and partners. It must be signed off by senior management from the key parties involved.

6 Examples of key FAs/departments that should be involved in this process include (but are not limited to) Venues and Infrastructure, Villages, Transport, Energy, Logistics, Food and Beverage, Ceremonies, Procurement, Commercial, Licensing, Brand Identity and Look, and Technology.

While the climate action plan will provide a collective strategic approach for minimising GHG emissions related to the Games, specific implementation of the recommended actions will need to be through integrating measures into detailed action plans owned by different departments and FAs. For example, low carbon options for transport must become part of the mandate of the transport FA (and usually the city transport authority as well), and coordinated with commercial and procurement departments, so that sponsorship and purchasing decisions are fully aligned with the sustainability objectives.

This is most readily achieved through an effective management systems approach, which ties in neatly with the OCOG's obligations under the IOC Olympic Host Contract – Operational Requirements (SIL 06) to operate according to the ISO 20121:2024 standard for Event Sustainability Management Systems.

3.1.3.2 Outcome

- Implementation of the climate action plan. Specific action plans for individual FAs should be developed, and must be supported by appropriate monitoring and evaluation processes before, during and for two to three months immediately after the Games. Key delivery bodies and partner organisations should develop their own action plans, which should be aligned as best as possible with the overall Games' climate action plan. Publication of the climate action plan should also be considered (see chapter 5).

3.1.4 Revised carbon footprint

One or more revisions to the reference carbon footprint should be calculated during the period leading up to the Games. This will be part of the iterative process to enable more refined decision-making once operational details are better defined and the suppliers across key emission sources are in place and onboarded.

3.1.4.1 Content

As soon as the OCOG has reached a sufficient level of maturity in terms of management system processes and IT systems, data owners should be engaged with regard to agreeing data collection processes and timelines. The earlier this is achieved, the better, in order to enable successful data capture. While there will still be degrees of uncertainty in plans and therefore data, the greater levels of operational planning and supplier-specific input should provide a greater opportunity to use physical data across more emission sources, leading to a more accurate picture. This revised carbon footprint will be a foundation for the actual carbon footprint, and thus follow the same steps as outlined in section 3.1.5.

3.1.4.2 Outcome

- Data owners identified and engaged – agreed expectations on types and format of physical data to be collected, as well as the processes for collecting and receiving this data.

- Carbon calculation tool trialled – carbon calculation tool set up and tested, with learnings and improvements identified and integrated for the actual carbon footprint.

- Better data utilised to assess progress against the climate action plan and carbon budget risks identified – more refined carbon footprint forecast completed with improved data quality, and status against forecast carbon budget evaluated.

3.1.5 Actual carbon footprint

This is where we switch from predicting potential impacts to reporting real results. The main objectives are:

- To report the carbon footprint of the Games based on measured data.

- To demonstrate compatibility between achieving climate action plan targets and delivering excellent Games.

- To contribute to building knowledge and know-how around the Games' carbon footprint for future OCOGs and their partners.

3.1.5.1 Content

While the reference carbon footprint is mainly based on assumptions or financial data, the actual carbon footprint should be largely based on physical data measured throughout the planning and staging of the Games, including the immediate post-Games decommissioning and dissolution phase.

Compiling the actual carbon footprint consists of two successive steps:

1. Data monitoring: Once the reference and revised carbon footprints have been completed, it will be possible to define a comprehensive list of data that must be collected during the Games operational phase for calculating the actual carbon footprint (see section 4.2.3 for more guidance on data quality expectations). The OCOG's Sustainability team will be responsible for determining which data are needed and from where they can be sourced.

2. Measuring the actual carbon footprint: Most, if not all, methodological questions should be resolved ahead of the Games in order to reduce as much as possible the workload during the busy months before, during and immediately after the Games. Ideally, post-Games tasks should be limited to collecting a final set of data identified earlier (from suppliers, sponsors, other FAs and delivery bodies), and then processing these data and calculating the actual carbon footprint of the Games. Data available and collected during the Games planning and development phases should be modelled before the Games. This will reduce the workload after the Games, and will also increase the quality of the carbon footprinting process through "learning by doing" – for example, correcting data inconsistencies and plugging gaps where data are missing.

The post-Games period presents some significant challenges: the OCOG disbands rapidly and many data owners may leave shortly after the end of the Games. Even among other delivery bodies and partner organisations that are ostensibly permanent and not going through dissolution like the OCOG, their Games personnel may be redeployed and data monitoring systems turned off.

To anticipate such challenges in collecting final data, it will be important to understand dissolution timelines for each data-owning FA/organisation: identifying key personnel who will remain after the Games, and ensuring they are adequately briefed/trained to provide the necessary data and have the remit to do so.

These processes should be tested in the run-up to the Games, for example as part of the revised carbon footprint. By doing this, you should gain a reasonably accurate and up to date snapshot of the likely results and ensure that everyone can do their tasks.

3.1.5.2 Outcome: Publication of the actual carbon footprint
The results of the actual carbon footprint should be published as part of the post-Games sustainability report, normally within six months of the end of the Paralympic Games. Noting the aforementioned post-Games time pressures, it might be helpful to draft the actual carbon footprint before the Games to save time and minimise risk. The final version of the report can then be compiled quite quickly – effectively just dropping in new data and updating analysis and commentary. See chapter 5 for further guidance on what the actual carbon footprint report should contain.

3.2 Resource requirements

This work will require time, personnel and budget. It will also depend on effective project management and coordination across a number of organisations from the outset.

We recommend the project is managed by the OCOG's Sustainability FA, with a dedicated team member assigned to lead the work. This should be an early priority appointment. The key tasks for the project manager will be:

- Identifying data owners, and building a network of contacts across key FAs and with other delivery bodies and partner organisations.
- Supporting each FA lead to appoint an FA representative, who will liaise with the Sustainability FA to provide the data and insight while also supporting cooperation on actions.
- Establishing of a specialist carbon advisory group, drawing on external expertise from academia, business, NGOs and government agencies.
- Coordinating data gathering.
- Procuring specialist expertise to do the carbon footprint calculations and managing the contractual relationship with those appointed to do the work.
- Mapping roles and responsibilities as part of the development of the climate action plan.
- Determining data requirements for each FA and external partner.
- Establishing internal processes to ensure efficient measurement and monitoring of data, and coordinating with external data providers (e.g. venues, sponsors, transport authorities, other delivery bodies, etc.).
- Providing content for sustainability strategies and progress reports, and for stand-alone carbon reporting as appropriate.
- Ensuring the required data can still be collected through the post-Games dissolution phase in order to guarantee an accurate actual carbon footprint calculation.

We would not normally expect the OCOG to have the in-house capacity to do the detailed calculations for the carbon footprinting. It should therefore be supported by experienced carbon or LCA specialists, and by contracting some aspects of the work to external consultants.

In terms of budget implications, the direct costs to be considered are headcount for the OCOG sustainability manager for this project, and consultant support. All other costs associated with implementing GHG emissions avoidance and reductions should be integrated into the relevant FA budget and managed through core processes such as venue design and procurement.

Although most carbon-saving measures should lead to an overall cost saving for the OCOG, this may not be true in the case of certain individual FA budgets, and it will be important to understand overall lifetime costs as part of making purchasing decisions. Many of the carbon-saving initiatives may arise via commercial partners, and therefore sustainability requirements should form part of sponsorship negotiations.

3.3 Data collection: An important but complex process

Data collection is a critical element of delivering a high-quality carbon footprint. However, it is usually the most challenging aspect of the carbon footprinting process. Key practical considerations for effective data collection are offered below. More detail on types of data and data quality can be found within section 4.2.3.

The main challenges relating to data collection are:

- Data monitoring must be carried out over an extended period, covering the time from the Games host election to a few months after the Games have ended. As the OCOG grows and other partners come on board, it becomes more difficult to follow who is doing what and to maintain contact with data owners. The latter may change as individuals take on different responsibilities and increased workloads, and it requires continual effort to ensure data collection is done and transmitted to the Sustainability team.
- There will be many data sources within the OCOG and among external stakeholders responsible for key Games deliverables. A coordination plan must be put in place to ensure efficient exchanges between all stakeholders.
- Data owners must be well briefed on the requirements and data collection methods to ensure that good-quality data are obtained.
- Although the baseline carbon footprint will help identify most data needed, the constant development of the Games project will inevitably mean that additional information is needed during the latter stages. The challenge is to be aware of new initiatives and identify potential carbon footprint implications, which requires proactive engagement across the organisation and with Games delivery partners to minimise the risk of surprises.
- Some data may not be shared for reasons of confidentiality.

It is not reasonable to expect to capture every item, or to be able to measure the Games' carbon footprint with total precision. However, with strong project management and data management processes in place, one can anticipate that the significant GHG emissions will be identified and measured.

The application of an event sustainability management system in accordance with ISO 20121:2024[7] will be a vital tool in enabling the smooth collection of data through the OCOG's life cycle.

The following elements can facilitate the data collection process and ensure high-quality data:

- Use the reference carbon footprint and revisions to identify and characterise (e.g. type of data, units, timeline, data owners, etc.) as accurately as possible the data requested for the actual carbon footprint.
- Ensure each FA has an appointed representative who will cooperate with the Sustainability FA to provide the data and/or liaise with suppliers on data.
- Identify and connect with each person who has access to the requested data, including external staff (the so-called "data owners").
- Provide a data collection template – for example, based on information provided in chapter 7 – to relevant functional areas and data owners.
- Educate data owners about the aims, needs and methodology of carbon footprinting to enhance proactivity and engagement – for example, through workshops.
- Carefully plan the monitoring and data collection: identify data owners, define responsibilities and deadlines, be reactive and offer support.
- Apply a "learning by doing" approach by calculating a revised carbon footprint between the first reference carbon footprint and the actual carbon footprint.

3.4 Review and validation

As the Games is the world's largest public-facing sports event, it can be expected that the carbon footprint will come under internal and external scrutiny. It is therefore important for review and validation processes to be built in at all stages of measurement, thereby improving both internal and external confidence in the carbon footprint.

3.4.1 Review and validation by the IOC

The IOC's Sustainability team and its specialist advisers will work in close cooperation with those responsible for calculating the initial carbon footprint during the Targeted Dialogue phase, and with the OCOG Sustainability team throughout its life cycle. There will be a strong element of co-creation and sharing of knowledge and experience throughout this process.

When it comes to formal publications, both of carbon footprint versions and of the climate action plan, the IOC will conduct final reviews and provide comments before publication. Reviewing that the statements are in line with the principles of this methodology, and that commitments are being upheld.

3.4.2 Review and validation by an external technical advisory group

It is worth establishing a technical advisory group of external experts and relevant stakeholders in this field. Not only will it encourage strong engagement from important stakeholders, but it should also help improve the quality and credibility of the carbon footprint and climate action plan. Such a group can also be asked to validate methodological choices and to review the progress made.

Optionally, a certifying body can be hired to participate in the project. This would usually be to validate methodology and verify calculations, although this is not mandatory. However, given the existence of this standardised methodology and broader requirements linked to the ISO 20121:2024 certification, additional carbon-specific assurance may not be necessary. Ultimately, any decisions regarding additional levels of verification and assurance will be based on the climate of stakeholder opinion – and possibly even regulatory requirements – in the host territory.

3.4.3 Review and validation: What to consider

To ensure the review and validation process (whether internal or external) can be navigated efficiently, it is important to document clearly the following aspects of best practice when working through the carbon footprint process:

- Procedures for identifying sources of emissions within the carbon footprint boundary, and the rationale for any exclusions.
- The reporting period covered by the carbon footprint.
- Procedures and systems used to collect, document and process GHG emissions data at the emission source and event level.
- Descriptions of quality control procedures applied to limit data errors (e.g. in-built calculation checks, comparisons with other event data, recalculation by second persons, etc.).
- All data sources and any assumptions used – ensuring existence, quality and retention of documentation to create an audit trail of how the inventory was compiled. This includes both activity data and emission factors.
- How GHG emissions have been calculated.

7 See IOC Olympic Host Contract – Operational Requirements, SIL 06: Sustainability Management System (SMS).

4 CALCULATING THE GAMES' CARBON FOOTPRINT: TECHNICAL GUIDANCE

Section 2.4 describes the four key steps of carbon footprinting. This chapter provides detailed guidance on what is involved in each of these steps.

4.1 Step 1: Scope definition

This section describes what must be taken into account to calculate the Games' carbon footprint of the Games: the types of emissions (direct and indirect), the geographical boundaries, the time periods to cover and the specific activities to include. Setting the Games' carbon footprint boundary is based on a number of considerations, including but not limited to:

- strength of association to the Games;
- levels of OCOG ownership, control and influence;
- expected materiality of emissions sources; and
- likelihood of data availability.

4.1.1 General principles for defining GHG emissions to be included in the carbon footprint
The carbon footprint methodology follows the life cycle approach, accounting for all life cycle stages of the activities to be measured: extraction of raw materials, transportation, production, distribution, use and end-of-life treatment.

It is also important to map and understand early all related Games activities, the different stakeholders involved and who is responsible for what. Every Games is different, and OCOGs operate in a complex stakeholder landscape. Having clarity, and maintaining this clarity as plans evolve, will support every element of the carbon footprinting process.

4.1.1.1 Direct and indirect emissions
The definition of the system boundaries includes all direct and indirect emissions related to the Games, corresponding to the GHG Protocol's Scopes 1, 2 and 3.

- Scope 1: Direct emissions from fuel combustion in owned machines, devices and vehicles.
- Scope 2: Indirect emissions from purchasing energy, in particular electricity, steam, heat or cooling.
- Scope 3: Indirect emissions from upstream and downstream activities, such as travel, purchased goods and services.

Direct emissions are under the full control of the organisation, while indirect emissions are not. However, as indirect emissions can sometimes be several times higher than direct emissions and can be influenced by the OCOG, a comprehensive carbon footprint must include them.

4.1.1.2 Geographical boundaries
Indirect emissions may occur at a large distance from the Games' host territories. As they are included within the scope of the project, no geographical boundaries are defined. The emissions are taken into account wherever the activities take place.

4.1.1.3 Time boundaries
The time period includes the full life span of the Games project – from the point of being elected Games host, through the years leading up to the Games, and on to the post-Games dissolution phase. The latter may not be a precise end point – sometimes, the legal dissolution of the OCOG can be more than a year after the end of the Games. However, in terms of meaningful GHG emissions, it is generally safe to assume the majority of activities will have ceased by three to four months following the end of the Paralympic Games.

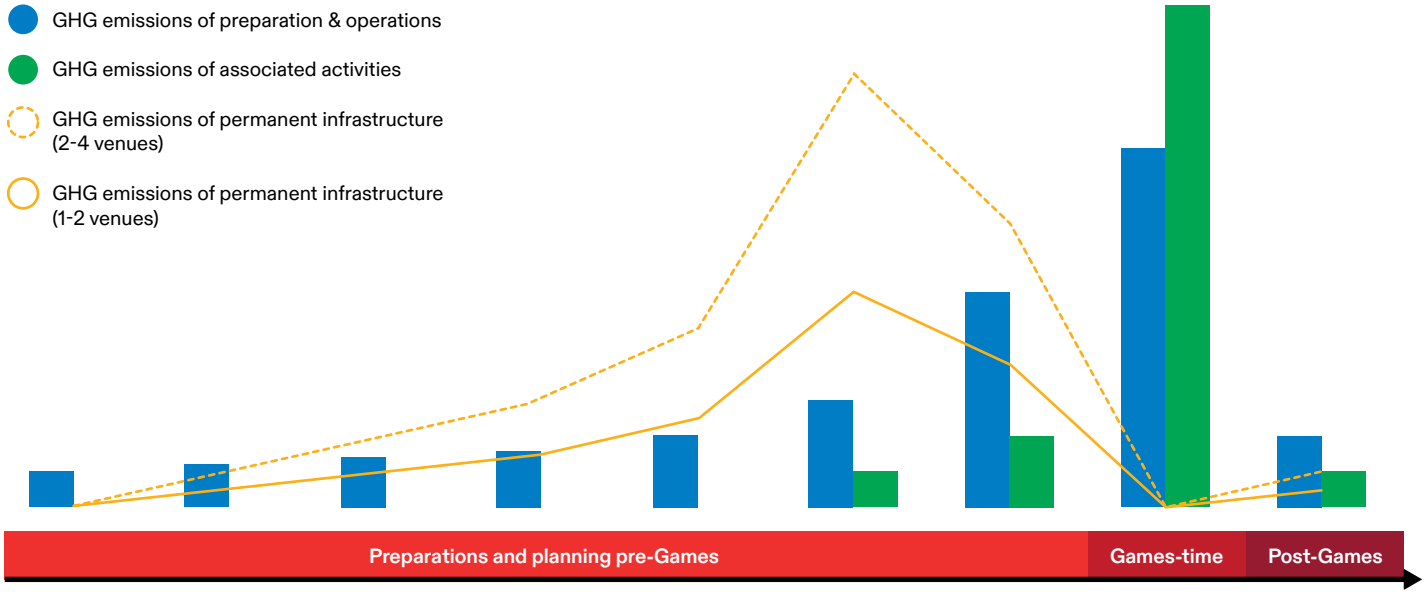
Figure 5 on the following page shows a schematic of Games-related GHG emissions over time. If there are significant venue conversion works after the Games as part of legacy plans, they may take considerably longer. However, they will not be the responsibility of the OCOG, and it should be up to the organisation(s) delivering these works (or "legacy owners") to account for any further GHG emissions (see also section 7.2.2.1).

4.1.1.4 Determination of which activities should be included, and which should not
The Games' carbon footprint comprises all GHG emissions that can causally be attributed to the Games. A proportion of these, but by no means all, will be directly due to the activities of the OCOG.

Other emission sources will be the result of activities by other Games stakeholders, such as delivery bodies responsible for building venues and infrastructure, security services, commercial partners, broadcasters and others in the Olympic Movement (the IOC, NOCs, IFs, athletes, technical officials and support personnel). Although these stakeholders are outside the direct control of the OCOG, there is potential for the OCOG to wield some influence wherever there is some form of contractual relationship or official function, and therefore some of these emission sources are to be included in the Games' carbon footprint.

There are also emission sources that are clearly due to the Games but over which the OCOG will have little or no influence, such as the long-distance travel of spectators and their spending activities in the Games host city/region (e.g. accommodation, food, buying official merchandise, etc.).

FIGURE 5: SCHEMATIC ILLUSTRATION OF THE GAMES' GHG EMISSIONS OVER TIME



Although it may be difficult to measure these sources with any degree of accuracy, they are such a fundamental part of what makes up the Games that they should always be included in the carbon footprint calculations. It is fine to issue the data with strong caveats on data quality, but stakeholders will expect to see serious attention paid to this large segment of the Games' carbon footprint.

Press and broadcasting are complex areas. A large part of the on-site broadcasting activities, including the live TV feeds, are delivered by OBS. Since the IOC has taken responsibility for its own carbon footprint, the work of OBS is included in the IOC's carbon footprint calculations. There must be close liaison between OBS and the OCOG to make sure that all relevant GHG emissions are accounted for and there is no double counting.

Accredited Media Rights-Holders from different countries will also be active in the host territory during the Games, as will significant numbers of non-accredited media (journalists, photographers, broadcasters). This is a constituency similar to spectators in that the OCOG can exert relatively little influence on their carbon emissions other than through the workspaces and other services that the OCOG and/or host authorities provide.

Remote production of TV and other media content is even harder to measure. Media channels will also develop various side activities within their respective regions or countries, such as special TV shows, events and contests. They are related to the Games but must be treated as out of scope of the carbon footprint, as they would be impractical to monitor.

EXCLUDED ACTIVITIES OR PROCESSES

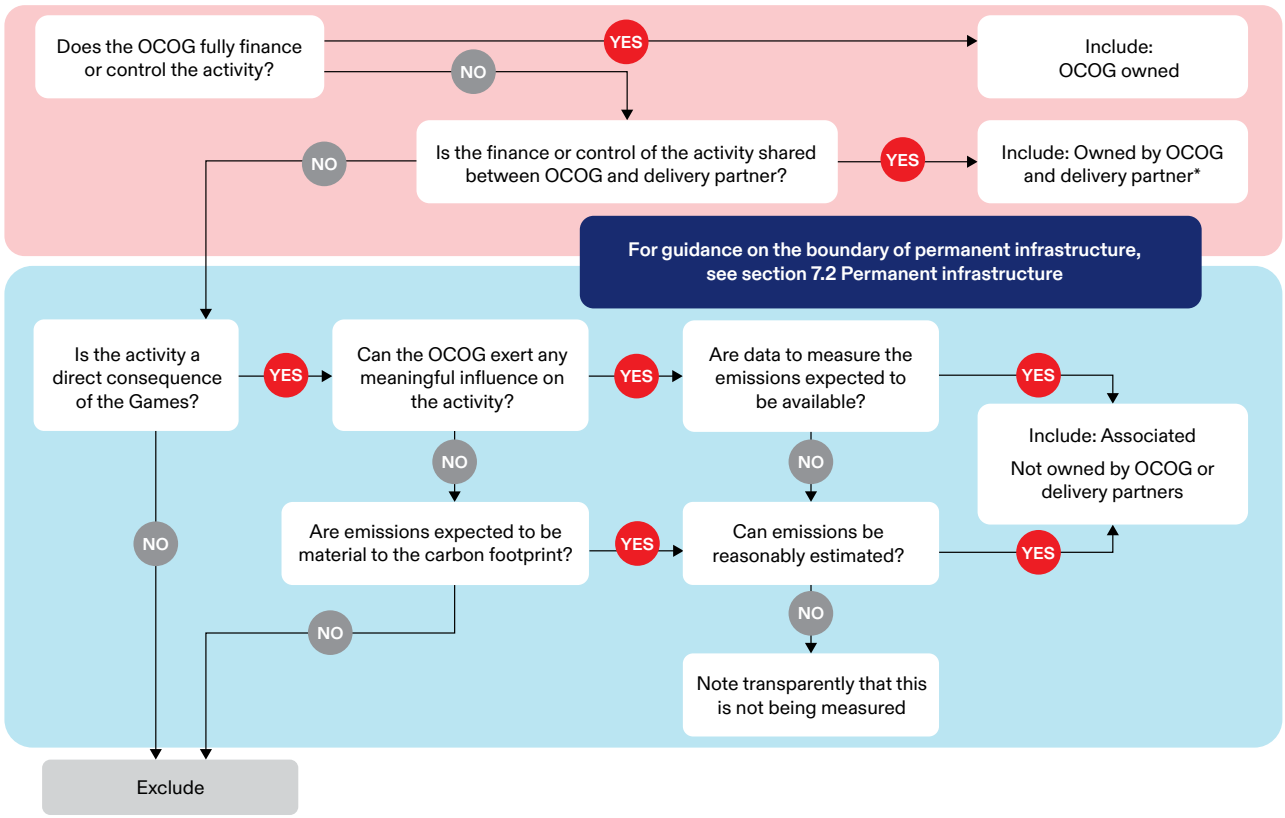
The basic rule is to include any activity, process or material for which the information is available according to previous explanations.

However, if the impact is foreseen to be negligible or the modelling is unfeasible due to lack of data, some activities can be excluded from the project boundary. Such exclusions must be listed and explained in the carbon footprint reports.

Figure 6 on the following page outlines a decision tree that can be used to support determining the carbon footprint boundary of the Games.

For Games-specific activities that are co-funded or co-owned by the OCOG and other entities (e.g. public authorities), full emissions should be included within the carbon footprint boundary. However, it is important to be aware of double-counting and ensure there is clarity on who is responsible for the data and reporting.

FIGURE 6: DECISION TREE FOR DETERMINING THE GAMES' CARBON FOOTPRINT BOUNDARY



The following section proposes a reporting framework structured in two different dimensions:

- First dimension: Classification by sphere of activity, with these spheres being:
  - Preparations and operations
  - Permanent infrastructure (construction related to the Games)
  - Associated activities
- Second dimension: Classification by sphere of responsibility or ownership of emissions, with the spheres shown below in Table 3.

TABLE 3: RESPONSIBILITY ALLOCATION RULES FOR EMISSIONS OWNED OR NOT OWNED BY THE OCOG AND/OR GAMES DELIVERY PARTNERS

Responsibility spheres	OCOG influence level	Description
Owned by the OCOG	High	Core activities, wholly funded by the OCOG Effectively under control of OCOG decision-making, but some commercial contractual restrictions may limit certain choices
Owned by the OCOG and Games delivery partners	Medium to high	Likely to be core activities and infrastructure, jointly funded by OCOG and Games delivery partners. Agreement between OCOG and Games delivery partners regarding allocation of carbon footprint and mitigation actions.
Owned by Games delivery partners	Medium	Activities funded by other Games delivery partners – public agencies, transport authorities and OBS. OCOG influence likely to depend on contractual or official relationship
Not owned by the OCOG or Games delivery partners	Low	Activities closely associated with the Games, with external funding (limited or no contractual relationship with the OCOG). For example, spectator travel and accommodation and NOC hospitality houses.

Table 4 (left hand column) gives an indicative outline of these two dimensions, leading to a proposed approach for the Games' carbon footprint boundary. The categories included in these spheres of activity are described in more detail in chapter 7.

Important note: The activities presented below are not comprehensive. Additional activities related to the Games and for which data are available should be added, even if they are not funded or controlled by the OCOG.

TABLE 4: INDICATIVE OUTLINE OF FOOTPRINT BOUNDARY ACROSS DIFFERENT SPHERES OF RESPONSIBILITY

Activity	Activity description	Expected sphere of responsibility	Expectation to be included in the boundary?
Preparations and operations Everything that is needed to organise and operate the Games.			
Office headquarters	7.1.1	OCOG	Yes
OCOG logistics	7.1.2		Yes
Overlay and temporary structures	7.1.3		Yes
Look of the Games	7.1.4		Yes
Energy use	7.1.5		Yes
Sports equipment	7.1.6		Yes
Electronic equipment and IT services	7.1.7		Yes
Uniforms	7.1.8		Yes
Merchandise	7.1.9		Yes
Catering	7.1.10		Yes
Ceremonies	7.1.11		Yes
Torch relays	7.1.12		Yes
Waste management	7.1.13		Yes
OCOG-coordinated security	7.1.14		Yes
OCOG-provided ground transport	7.1.15		Yes
OCOG-related workforce travel to venues	7.1.16		Yes
Accommodation	7.1.17		Yes
Live sites	7.1.18		Yes
Miscellaneous: For example: - Cultural programme/community engagement activities - Games specific activities not covered in other categories	Not included specifically within this guidance due to the uniqueness of activities, although content in this guidance could be applied	OCOG / Co-owned – OCOG and Games host city/region	Dependent on context, refer to decision tree

Activity	Activity description	Expected sphere of responsibility	Expectation to be included in the boundary?
Permanent infrastructure The construction of permanent venues and all related urban and transport infrastructure built specifically for the Games, including renovations/upgrades to existing venues.			
Competition venues	7.2	Co-owned – OCOG and Games host city/ region/Games delivery partner	See section 7.2.2
Non-competition venues			
Venue-related urban and transport infrastructure			
Associated activities Activities that are clearly due to the Games taking place but are not part of construction or organisational activities. For example, this includes spectator travel and accommodation during the Games, but not their accommodation for other purposes purposes such as post-Games tourism. By definition, as this sphere of activities are more distanced from OCOG control, it is harder to capture relevant information, and this may therefore be challenging to calculate.			
Uniforms (other) (e.g. NOC uniforms)	7.3.1	Not owned by the OCOG or Games delivery partners	Yes, if data available
Travel to the host country and to venues (NOCs, spectators, other)	7.3.2		Yes[8]
Travel to torch relays (spectators, other)	7.3.3		Dependent on context, refer to decision tree
Accommodation (spectators, NOCs, other)	7.3.4		Yes[9]
NOC/NPC houses, IF and commercial partner pavilions	7.3.5		Dependent on context, refer to decision tree
City operations	7.3.6	Not owned by the OCOG	Dependent on context, refer to decision tree
Miscellaneous: For example: - Activities across host nation - Wider cultural Olympiad activities	Not included specifically within this guidance due to the uniqueness of activities, although content in this guidance could be applied	Not owned by the OCOG or Games delivery partners	Dependent on context, refer to decision tree

4.2 Step 2: Data collection

Once the activities to be included in the carbon footprint have been identified and listed, the next phase consists of collecting the data. The main questions are:

- What data sources can be used and where can they be found?
- How might the data quality improve over time?
- What are the data to be collected at different phases of the carbon footprinting process?

4.2.1 Data sources: Where to find the data to be collected?

When possible, the use of primary data – data that can be directly measured or collected – should be favoured. Project documents and raw data from internal FAs, project teams and main partners and suppliers are the principal sources of information. Primary data have a high level of quality and are the most accurate and the most representative within the specific context of the Games.

8 It is expected that ticketed/accredited stakeholders are included in the carbon footprint boundary. However, it is understood that information and data relating to non-ticketed/accredited stakeholders may be very difficult to obtain. Therefore, non-ticketed/accredited stakeholders should therefore be considered and evaluated based on the boundary decision tree

9 As per the above footnote, in relation to accommodation.

Only when primary data are not available may secondary data sources be used. These include estimations, statistics, data from previous Games, documentation from the city, state or federal government and agencies, or published data sets.

When neither primary nor secondary data are available, default data can be used.

In all cases, the presentation of carbon footprint calculations must include a clear explanation of the sources of the data, any assumptions made, and an evaluation of the quality and reliability of the data.

Chapter 8 provides examples of data sources, but they are only indicative. Each Games and each OCOG will have their own specific contexts, and it is not practical to provide a definitive list of relevant FAs and supplier categories.

For the initial carbon footprint, much of the required data can only be approximated since there are too many unknown aspects in the years before the event. Most of the data will thus be based on estimates or secondary data. The data quality at this stage is quite low, but this is not problematic: the main objective of the initial carbon footprint is to identify the priorities for carbon impact reduction and the most important data to collect for the actual carbon footprint.

The actual carbon footprint will normally be calculated from primary data collected by the OCOG before, during and up to three months or so after the Games.

4.2.2 What are the data to be collected?

There are two types of data to be collected when calculating a carbon footprint.

1. Physical flows, such as kilograms of cotton used for merchandising, tonnes of waste incinerated, litres of diesel consumed for generators, and megawatt hours (MWh) of electricity from the grid used at competition venues during the Games.
2. Financial flows, such as the total budget for the overlay or the total budget for sports equipment. The accuracy of a carbon footprint calculated based on financial flows is generally lower than a carbon footprint calculated with physical flows, but these types of data are necessary when physical flows are unknown or too complex to be modelled.

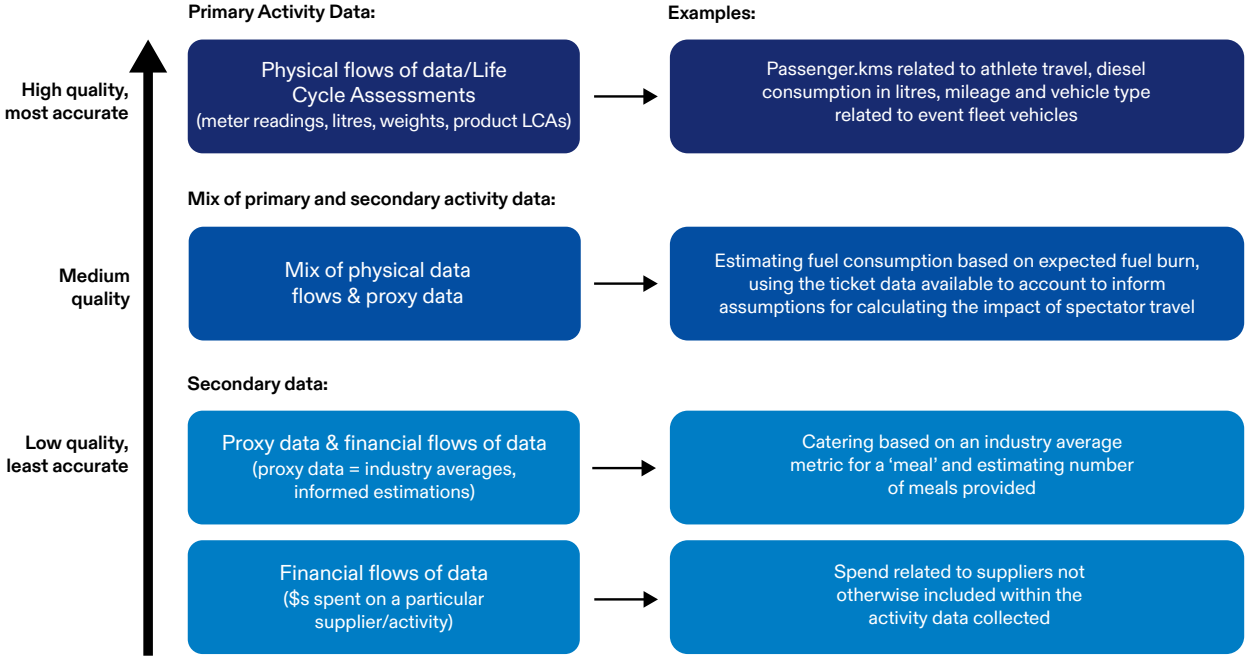
When using financial flows, the cost price – that is, the amount of money it costs to produce the product without adding profit – should be used as a preference if available, rather than the retail price. This is because the retail price includes a "mark-up" that is solely profit and is not activity-related (and therefore not emissions-related). In this case, the list of data to be collected is much shorter, but the accuracy will generally be lower compared to a carbon footprint calculated with physical flows.

The description of the data types to be collected for each category are given in chapter 7 (e.g. physical data or financial data, amount of energy consumption, amount of material, etc.), together with detailed examples of flows (e.g. kWh of electricity consumed, kilogram of cotton, kilogram of steel, etc.). It is highly recommended to report all the data used in the carbon footprint in tabular format as presented in chapter 7, and to keep track of all sources and assumptions.

4.2.3 Measuring data quality

Data quality is expected to improve significantly through successive carbon footprint iterations – from low data quality within the initial and reference carbon footprint, to improving data in the revised carbon footprint(s), to having much better quality of data come the actual carbon footprint. The objective over the course of the Games' life cycle is to move data sources up the data quality hierarchy (see Figure 7 right hand column). This will help reduce uncertainty and reliance on assumptions, ultimately improving the accuracy of your measurement and allowing you to better track, monitor and evaluate the carbon footprint.

FIGURE 7: DATA QUALITY HIERARCHY



The ideal scenario is to have physical flows of data across all activities you need to measure within your carbon footprint boundary. However, given the huge amount of data required from many data owners, and the balance between resource and reward for collecting data, it is not realistic to expect this level of accuracy for every aspect of your carbon footprint. Where physical flows of data are neither available nor feasible from a resource perspective, financial flows of data can be used.

Given the expected evolution of data quality over time and the need to communicate this to stakeholders, it can be helpful to score data quality across the carbon footprint. Table 5 outlines a data quality scoring framework that can be used to measure data quality across activities within the carbon footprint.

4.3 Step 3: Data modelling

The carbon footprint calculation of the Games consists of:

- Multiplying each flow described above by its specific emission factor.
- Summing the intermediate results to obtain the total carbon footprint per category, per sphere of activity or per sphere of responsibility, and finally the total carbon footprint.

4.3.1 Emission factors and existing databases

The GHG emission factor of a specific activity or product represents the sum of all GHG emissions to air related to it, a figure that is then converted to kilograms of carbon dioxide equivalent ($kgCO_2e$). These factors are available in different databases (see section 8.2). The data translated to GHG emissions using the emission factors can be summed up, and the results of the carbon footprint are expressed in $kgCO_2e$ or tCO_2e. The following guidance outlines key considerations for selecting appropriate and relevant emission factors:

- Geographical relevance – Apply location-specific emission factors where appropriate. This may be at country or state level. Where country-specific factors are not available, choose those that are most geographically reflective of the area (e.g. regionally applicable). In some instances, location may be irrelevant.
- Activity coverage – Ensure that emission factors cover the complete activity within the scope of the calculation. Where this is not possible, highlight any exclusions.
- GHG coverage – Ensure that the emission factor covers all relevant GHG emissions within the scope of the assessment. Most emission factors should cover all GHG emissions (CO_2e). Where this is not the case, this should be specified.
- Source reference – Ensure that emission factors derive from a reliable source reference. This should ideally be an internationally/nationally recognised body, undertaken in a peer-reviewed study. Emission factors should be as up to date as possible.
- Relevant units – Ensure the emission factors are selected as an appropriate conversion against which the data are provided (e.g. kWh, litres, hours, etc.).

Where to find emission factors?

Examples of emission factor sources are presented in section 8.2.

4.3.2 Tool for calculating the carbon footprint

Once the most useful databases have been identified, noting that they may evolve as you start collecting the data, the next step is to multiply each flow collected in the previous step by its specific emission factor and sum up the intermediate results. Although not mandatory, it is recommended to delegate this task to specialist carbon accounting practitioners – it can be quite complex, and requires expertise for selecting the correct datasets and/or emission factors and ensuring coherence with the units. It will also simplify the interpretation of the data collected and of the results.

The carbon footprint can be calculated using a Microsoft Excel spreadsheet, or software tool formats could also be explored. Whichever route is chosen, it is crucial to consider that the boundary and types of activities for calculating the Games' carbon footprint are nuanced compared to a typical corporate carbon footprint. With the increasing levels of detail likely to be obtained for the actual carbon footprint, calculating a good-quality carbon footprint for the Games is a complex and time-consuming task.

TABLE 5: DATA QUALITY SCORING FRAMEWORK

Score	Data quality description
1	High – All activity data are provided as physical flows by the relevant data owner. All data are substantiated by relevant sources and evidence. Emission factors are specific to the data collected and based on robust databases.
2	Medium – Data are based on physical flows provided by the relevant data owner, with the need for some reasonable assumptions and estimates. Reasonable assumptions and estimates may include extending the sample size to the actual data and/or applying physical, economic or industry proxies. These assumptions should be substantiated and evidenced. Emission factors match physical flows of data but there may be some assumptions involved.
3	Low – No or limited activity data available. The majority of the data derive from financial flows/spend proxies or industry and sector benchmarks. All assumptions and proxies should be substantiated and evidenced. Financial flow emission factors primarily used.

These factors should be thoroughly considered from both a tool selection and resourcing standpoint.

There are various tools for calculating LCAs and carbon footprints. Only a few of them are free. For most commercial tools, there is usually a free demonstration version available, which can help the user decide on the suitability of the tool for a particular application.

4.3.3 Additional modelling rules for specific topics

In some cases, it is necessary to define specific modelling rules to be applied. This is the case for the following topics:

- Electricity – in particular, defining rules for the electricity mix, and for calculating the emission factor for a renewable electricity mix.
- Rented equipment – in particular, defining rules for modelling its GHG emissions compared to purchased equipment.
- Bio-based materials and fuels (e.g. wood, biofuels, cotton, etc.) – in particular, defining rules on how to consider biogenic carbon, which is the carbon that is incorporated into the biomass during growth (carbon uptake, the result of the photosynthesis effect) and can be released during decomposition or combustion at the end-of-life.
- Financial flows – in particular, defining rules to use emission factors from financial databases with current monetary value specific to the Games host country.

The rules for these topics are described in chapter 9.

4.4 Step 4: Interpretation

4.4.1 Identify key data to be collected for carbon footprint refinement

The reference carbon footprint calculated at the onset of Games planning will be mainly based on assumptions and statistics, and therefore includes high levels of uncertainty. It does, however, serve to:

- identify the data to be collected; and
- identify the high emission categories, which inform where primary attention should be focussed regards improving data quality.

This will facilitate the subsequent data collection steps for future iterations of the carbon footprint. An analysis of the reference carbon footprints should enable you to identify activities that contribute most to the carbon footprint, together with the key parameters that influence the results. Future iterations of the carbon footprint should focus on these larger impacts and give lower priority for activities that have a small contribution to the carbon footprint, unless they have a particular symbolic value (e.g. the flame for the Olympic torch) or present significant reputational risks. This specific analysis will guide the sustainability strategy towards efficient reduction measures.

4.4.2 Reduce GHG emissions

Reducing the carbon footprint of the Games is of strategic importance to the IOC, and there is an obligation on OCOGs to minimise their carbon footprint and influence reductions across the family of Games delivery partners. Emissions avoidance/reductions are, therefore, an essential component of an OCOG's climate action plan. While there may be numerous options, priority should be given to those that will have the greatest effect in limiting GHG emissions (e.g. avoiding new construction).

The concrete steps to reducing the Games' carbon footprint are the following:

- Identify potential reduction measures. There are several ways of identifying measures or actions that could reduce the Games' carbon footprint, some of which can be found in literature or documentation from previous Games. It is also worth organising workshops with those involved in the process of providing data (staff from the different FAs, suppliers and partners), to help identify early best practices and reduction opportunities.
- Calculate the reduction potential of these measures. The GHG emissions reduction potential of the different measures are calculated using the carbon footprint methodology and are called "sensitivity analyses".
- Set the action plan (select the measures to be put in place). The reduction measures can then be classified according to their potential for decreasing GHG emissions. Other parameters are important to consider when choosing the measures, such as feasibility level, implementation costs and awareness potential. A materiality assessment could also be carried out to capture the subjective needs and perception of the different stakeholders. Measures that address the stakeholders' expectations could then be assessed according to priority.

As an example, Figure 8 presents an analysis of the different measures (scenarios) according to three parameters: the GHG emissions reduction potential, the awareness potential and the feasibility level. Accordingly, to the principle of transparency, the GHG emissions reduction potential is expressed relative to the Games' total carbon footprint. In addition, it can also be expressed relative to the category, the sphere of responsibility or the sphere of activity.

4.5 Key steps to calculate the carbon emissions of an activity

Figure 9 below provides a summary of the key steps to calculate the carbon emissions associated with an activity.

FIGURE 8: REDUCTION POTENTIAL DECISION MATRIX BASED ON FEASIBILITY LEVEL AND AWARENESS POTENTIAL[10]

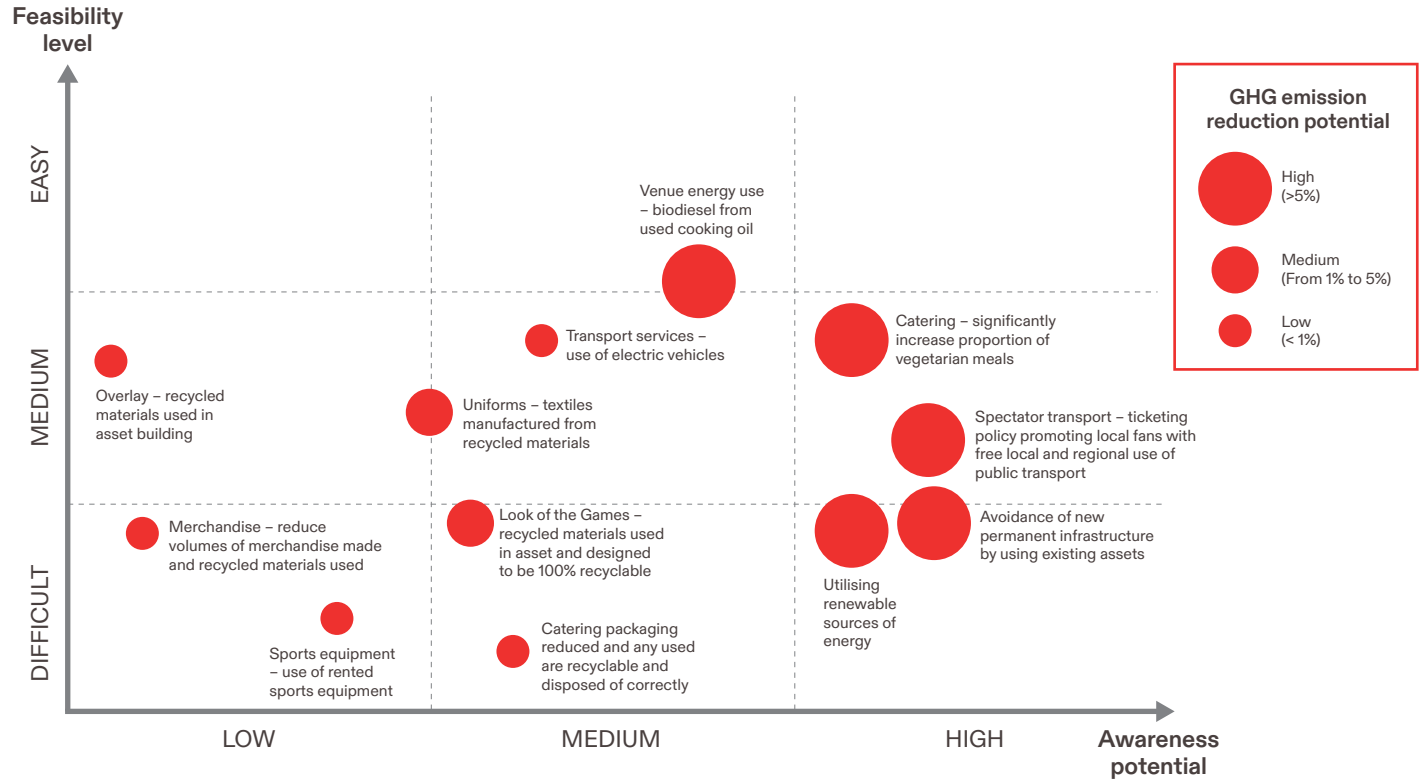
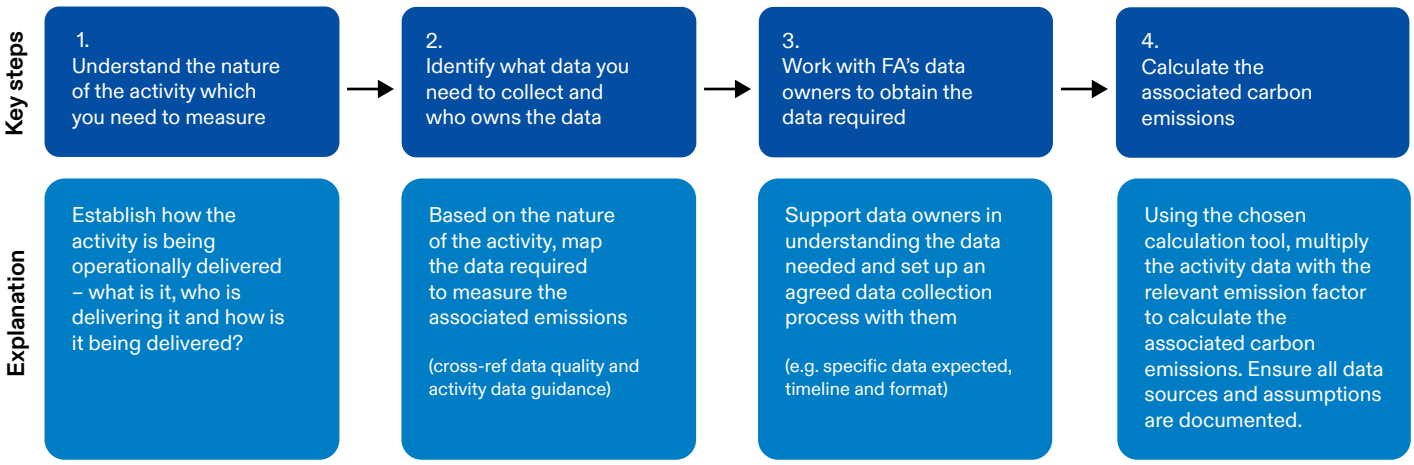


FIGURE 9: SUMMARY OF THE KEY STEPS TO CALCULATING THE CARBON EMISSIONS ASSOCIATED WITH AN ACTIVITY



10 Graphic and measures are indicative, and options should be explored in the specific context of Games operational plans.

5 COMMUNICATION AND REPORTING

It is important to communicate the results of the efforts and decisions made to reduce the carbon footprint, both internally and externally.

Internally, it is good for OCOG staff to be engaged in the approach, understand its objectives and feel their contributions are recognised and achieving positive results. This can be done via workshops or by circulating infographics.

External communication is also important – not only through the publication of reports, but also by creating a dedicated webpage, hosting webinars, creating interactive tools or apps, and presenting on-site activities during Games time to raise public awareness.

5.1 Communication principles

The golden rules for communicating about the Games' carbon footprint are transparency and honesty, avoiding any risks of greenwashing or overstatement.

To avoid confusion, data and numbers must be presented separately between the three main sphere of activities – preparations and operations emissions, permanent infrastructure emissions and associated activities emissions. A clear explanation must be given for any excluded categories.

For example, if the OCOG communicates on the subject of carbon compensation, it is important to clarify whether the compensation is limited to OCOG-owned emissions or if it covers the entire Games' carbon footprint. Statements such as "zero carbon", "carbon-free" or "carbon neutral" should not be used as they are misleading.

5.2 Recommended reporting milestones

Formal reporting is essential to provide the credible underpinning for any wider communications efforts related to the Games' climate action plan. It is also valuable for knowledge transfer purposes from one Games to another, and to other events.

The following reporting milestones should be considered:

- Publication of the reference carbon footprint. Following IOC review, the reference carbon footprint should be released publicly, either as a stand-alone document or incorporated into the first edition of the Games' sustainability, impact and legacy plan. The publication should emphasise the preliminary nature of the carbon footprint and that it is a forward projection, not an actual result.

- Publication of the climate action plan. This should be pitched as a refined strategic plan covering the whole Games programme, setting out objectives, action areas and targets for avoiding/reducing GHG emissions along with timelines and responsibilities. It could be a stand-alone document, or it may be integrated into the overall Games' sustainability, impact and legacy plan if the timelines coincide. However, the climate action plan will be quite a detailed document, so it might be best issued as a distinct piece of work.

- Publication of the actual carbon footprint. This is the opportunity to report final results and lessons learned. Showcasing success stories and the associated GHG savings is always useful, and it is even more informative if you can openly highlight the difficulties encountered throughout the process, how they were addressed and identify possible improvements. This will help future OCOGs and other event organisers avoid the same difficulties.

Note: The initial carbon footprint and carbon management strategy that are required as part of the Targeted Dialogue phase are not public documents. However, summaries of these items will be included in the responses to the Future Host Questionnaire, which are usually published on the IOC's website: https://olympics.com/ioc/documents/olympic-games.

5.3 Reporting the carbon footprint: Essential information

The reference carbon footprint and actual carbon footprint must be reported in a clear and accessible style that can be understood by non-specialists. There should be a section summarising the OCOG's methodological approach, referencing this guidance for full details of the methodology. In addition to the local language, all formal reports must be issued in English for the benefit of international audiences and knowledge transfer to future OCOGs, candidate cities and Games host cities/regions.

Specific information to be reported alongside the carbon footprint should include the items listed below.

5.3.1 General

- The reporting period for the carbon footprint (i.e. the time period that the carbon calculation covers).

- The date the carbon footprint was calculated (this will indicate any time lag between the reporting period and finalising the calculations).

- A central contact point for feedback/enquiries (internal only).

- Changes since the previous version and explanation(s) for such changes.

- A review statement by an external panel of experts (optional)

- The main limitations of the study.

5.3.2 Carbon footprint boundary

- A description of the approach: main principles, timeframe and calculation methodology (with reference to the present document for a full description of the methodology).
- A clear description of the Games project being assessed in the carbon footprint.
- Clear and comprehensive diagram(s) with categories included in the carbon footprint boundary.
- A comprehensive list of the activities excluded from the carbon footprint boundary and the associated justification

5.3.3 Data and assumptions

- Databases used for LCAs.
- LCA software used and version number (when relevant).
- Comprehensive tables of data used for the calculations, and corresponding sources assumptions and limitations (in particular, missing data missing; internal).
- Data quality assessment (see 4.2.3).

5.3.4 Results

- Carbon footprint results, displayed per sphere of responsibility or per sphere of activity and per category. Examples of reporting tables are available in chapter 6.
- Sensitivity analysis for reduction measures when relevant (especially for the climate action plan), with:
  - A list of reduction measures.
  - A description of the approach for selecting the measures and related documentation (such as decision matrix and/or materiality matrix).
  - Data used for the calculation of reduction potential of each measure, and corresponding sources and assumptions.
  - Potential GHG emissions reductions for each measure.
  - If relevant, include a note statement relating to third-party review, validation and verification.

6 CARBON FOOTPRINT PRESENTATION TEMPLATES

The carbon footprint report should include a tabular presentation in accordance with the main categories of activity and responsibility, as shown below in Table 6.

Note: where ownership may be shared between the OCOG and Games delivery partners, the respective proportion of these shared emissions should be allocated to the respective OCOG-owned and Games delivery partner-owned columns.

For the initial and reference carbon footprints and subsequent iterations, these data will be shown as projections of estimated GHG emissions. It is only for the actual carbon footprint where this table will provide data reporting emissions that have occurred.

A more detailed table for presenting estimates/results of the Games' carbon footprint broken down into activity categories should use the template in Table 7 and, where possible, itemise individual construction projects.

TABLE 6: SUMMARY REPORTING TABLE FOR THE GAMES' CARBON FOOTPRINT (GAMES' GHG EMISSIONS, PER tCO_2e)

Sphere of activities	Sphere of responsibility			Total (tCO_2e)	Data quality score
	Owned by the OCOG (tCO_2e)	Owned by Games delivery partners (tCO_2e)	Not owned by the OCOG or Games delivery partners (tCO_2e)		
Preparations and operations					
Permanent infrastructure					
Associated activities					
Total					

TABLE 7: DETAILED REPORTING TABLE FOR THE GAMES' CARBON FOOTPRINT PER CATEGORY (GAMES GHG EMISSIONS, PER TCO_2E)

Sphere of activities	ID	Categories	Sphere of responsibility			Total (tCO_2e)	Data quality score
			Owned by the OCOG (tCO_2e)	Owned by Games delivery partners (tCO_2e)	Not owned by the OCOG or Games delivery partners (tCO_2e)		
Preparations and operations	1.1	Office headquarters					
	1.2	OCOG logistics					
	1.3	Overlay and temporary structures					
	1.4	Look of the Games					
	1.5	Energy use					
	1.6	Sports equipment					
	1.7	Electronic equipment and IT services					
	1.8	Uniforms					
	1.9	Merchandise					
	1.10	Catering					
	1.11	Ceremonies					
	1.12	Torch relays					
	1.13	Waste management					
	1.14	OCOG-coordinated Security					
	1.15	OCOG-provided ground transport					
	1.16	OCOG-related workforce travel to venues					
	1.17	Accommodation					
	1.18	Live sites					
	1.19	Miscellaneous (if applicable)					
Permanent infrastructure	2.1	Competition venues					
	2.2	Non-competition venues					
	2.3	Venue-related transport and urban infrastructure					
Associated activities	3.1	Uniforms (other)					
	3.2	Travel to the host country and to venues (NOCs, spectators, other)					
	3.3	Travel to torch relays (spectators, other)					
	3.4	Accommodation (spectators, NOCs, other)					
	3.5	NOC/NPC houses, IF and commercial partner pavilions					
	3.6	City operations					
	3.7	Miscellaneous (if applicable)					
Total							

7 CATEGORIES AND CALCULATION METHODS

This chapter presents definitions of each category of activities and data. For each, it describes the activities that should be included or excluded, together with the data to be collected.

Inevitably, the list of activities and data shown here cannot be exhaustive. Each edition of the Games is different in terms of its number and configuration of venues, its organisational structure and its variety of special features and activities. Likewise, guidance on assumptions cannot be exhaustive. Project managers should therefore ensure that they understand how activities exist within their particular contexts, and also that the data identified for collection are as complete and accurate as possible for their context. All assumptions should be justified by reasonable, substantiated and documented rationale.

Expected data quality through carbon footprint iterations
The categories of "Data to be collected" identified within this chapter are based on the types of data that are expected to be considered for the Games' actual carbon footprint – for which, as far as possible, higher-quality data should be sought. This chapter aims to support in the understanding of what this higher-quality data might look like, as well as providing guidance on where it may not be the case across some more complex categories. It is recognised that for earlier iterations of the Games' carbon footprint, there will be a greater reliance on lower-quality data (e.g. financial data).

There is an expected level of data quality for all activities through carbon footprint iterations. These levels are set out below in Table 8. For data quality definitions, see section 4.2.3.

Data recording templates are signposted throughout this chapter. They are provided as a general framework to indicate the most likely types of data required and where they can be sourced.

Likewise, although we have indicated the most appropriate allocations of responsibility according to normal practice at the Games, there will always be some grey areas and variations from Games to Games. Therefore, it is important for the OCOG to verify these allocations according to its own particular circumstances.

Where relevant, emission factor databases are signposted across categories and in section 8.2.

A collective effort
It is important that OCOG functional areas (FAs) and suppliers are made aware of the data relevant to them, which will be required to measure the Games' carbon footprint across all iterations. Communicating this information as early as possible, including through the procurement and contracting phases for suppliers, will help share the responsibility for this data collection, and will therefore significantly support future conversations around data collection.

7.1 Preparations and operations

This sphere of activity includes everything needed to prepare and stage the Games, including OCOG corporate activities before the Games; overlay and sports equipment; energy consumption and waste management; catering, uniforms, accommodation and travel to the Games funded by the OCOG; and Games fleet transport services, including buses provided by the OCOG for accredited and ticketed individuals. These activities will largely be the responsibility of the OCOG, but some may fall within the responsibility of the IOC and other Games delivery partners.

7.1.1 Office headquarters

7.1.1.1 Category description
This category includes workforce-related activities in OCOG offices and those of its Games delivery partners:

- Energy consumption and type of tariff (electricity, energy for heating) in OCOG office spaces, including any energy consumption provided through on-site renewables.
- Production and consumption of goods and services procured by the OCOG to deliver the Games and not captured by other specific categories within this guidance – e.g. office equipment, IT and hardware, furniture, office supplies, decor and branding of workspaces, etc.
- Employee commuting and homeworking before the Games.
- Waste generated in OCOG offices for end-of-life disposal.
- Water consumption in OCOG offices.
- Business travel and accommodation for OCOG staff and associates related to OCOG activities, from the OCOG's inception to its dissolution (outside of Games time).

Over the Games' life cycle, it is likely that there will be more than one office location. All sites used as corporate offices should be included in this category. The workforce will also significantly increase over the OCOG life cycle, and staffing plans could be used to help forecast this expansion.

If there are separate office headquarters established for any specific Games delivery body responsible for the construction of venues and infrastructure, they should also be captured. The same data template may be used, but the figures should be allocated to the delivery bodies, not the OCOG's responsibility.

Normally, however, staff working for public agencies and other types of Games delivery partners are likely to be based at their usual offices, so there is no additional carbon impact to be considered. In any case, it would be impractical to separate this out from the rest of their organisation's carbon footprint.

TABLE 8: EXPECTED DATA QUALITY FOR ACTIVITIES THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Revised**
Preparations and operations	Majority low – based on financial flows	Low to medium – mostly financial flows; in some cases, projections/proxy data may be available from comparable activities at previous Games, and/or comparable venues/events within the Games host city, region or country	Medium – increase in projected physical flows, some financial flows	High across the majority of major categories, with some pockets of lower-quality data
Permanent Infrastructure		Low – financial flows; however, in some cases, projections/proxy data may be available from comparable activities at previous Games, and/or comparable venues/events within the Games host city, region or country	Medium to high – depending on status of life cycle assessments (LCAs)	High – LCAs conducted on permanent infrastructure works
Associated activities		Majority low – mostly based on financial flows and/or uncertain assumptions; in some cases, projections/proxy data may be available from comparable activities at previous Games and/or comparable venues/events within the Games host city, region or country		Majority medium – due to reliance on informed assumptions across these more OCOG-distanced activities

Not included in this category:

- Electronic equipment for the OCOG (included in "Preparations and operations: Electronic equipment and IT services"; see section 7.1.7).
- Office spaces used by staff at Games' venues (included in venue operational categories).
- OCOG staff, contractor and volunteer commuting and travel during Games time (included in "Preparations and operations: OCOG-related workforce travel to venues"; see section 7.1.16).
- OCOG staff and associates' accommodation during Games time (included in "Preparations and operations: Accommodation"; see section 7.1.17).

7.1.1.2 Data to be collected

GHG emissions are calculated as follows:

- Energy consumption – the total amount of energy consumed for each type of energy (e.g. electricity, gas, etc.).
  - See section 8.1.1 for a data recording table template.
  - See section 9.1 for guidance on reporting the production and purchase of renewable energy.
- Production/consumption of goods and services – ideally, for some key office items, the total amount of material used per type of material (e.g. paper, food, etc.) will be recorded and data will therefore be available. See section 8.1.4 for a data recording table template.
  - However, there will also be other OCOG spend that is not captured in other categories (e.g. legal fees, marketing, professional services and consultancy (some of which will be value in kind), office supplies, in-house catering, etc.). In these instances, where it is not feasible to collect more accurate data due to time and resource constraints, finance data may be used. See section 8.1.8 for a data recording table template.
- Employee commuting and homeworking:
  - Commuting – based on employees' travel distances to and from work, the mode(s) of transport they use and the number of times they commute.
  - Homeworking – based on the total amount of hours that OCOG employees work from home.
    - Conducting an employee commuting and homeworking survey, with a representative sample size, is often a good way to capture this data. See section 8.1.7 for a data recording table template.
- Waste generated – the total amount of waste generated and disposed of per waste stream.
  - See section 8.1.2 for a data recording table template.
- Water consumption – the total water consumed (including both supply and treatment).
  - See section 8.1.3 for a data recording table template.

- Business travel and accommodation for OCOG employees and associates related to OCOG activity – based on total distance travelled per mode of transport (often captured in the OCOG's expense or travel booking system).
  - See section 8.1.10 for a data recording table template.

Expected data quality through carbon footprint iterations can be found below in Table 9. For data quality definitions, see section 4.2.3.

7.1.1.3 Emission factors
The emission factor or calculation used for the consumption of diesel, natural gas and other energy sources must account for the extraction, refining and transportation of the raw fuels ("cradle-to-gate" or "well-to-tank") and combustion on site.

The emission factor or calculation used for electricity consumption must also account for the transmission and distribution from generation to the point of use ("cradle-to-gate").

The emission factor or calculation used for employee commuting must also account for the extraction, refining and transportation of the raw fuels before they are used to power the transport mode.

Please also refer to section 9.4, which explains how to take account of inflation and currency conversion rates so that the emission factors are applied accurately in present-day values.

7.1.2 OCOG logistics

7.1.2.1 Category description
This category includes freight transport, and the storage of goods and materials owned and operated specifically by the OCOG:

This category includes:

- Transport of assets, materials and equipment (e.g. furniture, sports and technology equipment, branding and signage, etc.) from OCOG warehouses to venues, including all inbound and outbound flows to assets for the duration of the OCOG's logistics operations before, during and after the Games.
- Energy consumption in warehouses used by the OCOG for the Games (before, during and after the Games).
- Fuel consumption for venue and warehouse logistics operations on site (fuel consumed by logistics vehicles on site).

Not included in this category:

- Logistics relating to Games goods and materials owned and operated by OCOG suppliers, such as getting goods and materials from within the supply chain to OCOG-owned warehouses or venues (this falls within the suppliers' responsibilities and is therefore included, where relevant, as sub-categories within other "Preparation and operations" categories).

7.1.2.2 Data to be collected
GHG emissions are calculated as follows:

- Transport of assets, materials and equipment are calculated based on either:
  - the weight of material transported multiplied by the total distance travelled (expressed in tonne.km) for each vehicle type;
  - the total fuel/electricity consumption by the OCOG fleet (expressed in litres or kilowatt hours (kWh)); or
  - the total distance travelled per mode of transport (expressed in km or miles).
    - See section 8.1.5 for a data recording table template.
- Warehouse storage – based on energy consumption in warehouses (mainly electricity, but also e.g. fuel for heating).
  - See section 8.1.1 for a data recording table template.
- Fuel consumption for logistics vehicles (e.g. forklifts) used on site (in venues or in warehouses) – based on the total consumption of each type of fuel (e.g. gasoline, diesel, biodiesel, etc.) or the electricity consumed for electric vehicles and machinery.
  - See section 8.1.1 for a data recording table template.

TABLE 9: EXPECTED DATA QUALITY FOR OFFICE HEADQUARTERS THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Energy consumption	Low	Medium	Medium	High
Production and consumption of goods and services	Low	Low	Low	Low
Employee commuting and homeworking	Low	Low	Medium	Medium
Waste generated	Low	Medium	Medium	High
Water consumption	Low	Medium	Medium	High
Business travel and accomodation for OCOG staff and associates	Low	Low	Medium	High

- Staff uniforms manufactured specifically for the Games period – follow data collection guidance set out in section 7.1.8.

If biofuels are used, apply the methodology described in section 9.3.

Expected data quality through carbon footprint iterations can be found below in Table 10. For data quality definitions, see section 4.2.3.

7.1.2.3 Emission factors
For other types of transport and for energy consumption at warehouses, use country-specific emission factors and/or emission factors specific to the database selected for this category.

The emission factor or calculation used for the consumption of diesel, natural gas or other energy sources must account for the extraction, refining and transportation of the raw fuels ("cradle-to-gate" or "well-to-tank") and combustion at the point of use.

The emission factor or calculation used for electricity consumption must also account for the transmission and distribution from generation to the point of use.

7.1.3 Overlay and temporary structures

7.1.3.1 Category description
This category includes the overlay required for all Games competition and non-competition venues, and any temporary structures that are built only for the Games and dismantled afterwards.

Since it can be sometimes difficult to separate overlay and temporary structures (O&TS), these two activities are merged in the same category. However, if they can be logically separated for a particular edition of the Games, it would be preferable to do so.

This category includes:

- O&TS transport of assets, materials and equipment from suppliers to OCOG warehouses and venues.
- O&TS fuel consumption, where the O&TS supplier has procured the fuel.
- O&TS waste generated on site through build and breakdown, where the supplier has procured the waste management supplier.
- O&TS staff and contractor travel associated with the Games project, as well as any specific Games project accommodation provided to staff by the supplier.
- O&TS materials and embodied carbon associated with the Games project.
- Staff uniforms (including personal protective equipment (PPE)) manufactured specifically for the Games period.

Not included in this category:

- Fuel consumption provided by OCOG fuel suppliers (included in "Preparations and operations: Energy use"; see section 7.1.5).
- Waste generated where waste management is provided by the OCOG (included in "Preparations and operations: Waste management"; see section 7.1.13).

7.1.3.2 Data to be collected
GHG emissions generated by the category "Preparations and operations: Overlay and temporary structures" are calculated based on the accumulation of each activity, which are themselves calculated as follows:

- O&TS transport of assets, materials and equipment are calculated based on either:
  - the weight of material transported multiplied by the total distance travelled (expressed in tonne.km) for each vehicle type;
  - the total fuel/electricity consumption through transport (expressed in litres or kilowatt hours (kWh)); or
  - the total distance travelled per mode of transport (expressed in km or miles).
    - See section 8.1.5 for a data recording table template.
- O&TS fuel consumption – based on the total consumption of each type of fuel (e.g. gasoline, diesel, biodiesel, etc.).
  - See section 8.1.1 for a data recording table template.
  - See sections 9.1 and 9.3 for guidance on reporting the production and purchase of renewable energy and biofuels.
- O&TS waste generated on site – based on the total amount of waste generated per waste stream through the site build and breakdown.
  - See section 8.1.2 for a data recording table template.

TABLE 10: EXPECTED DATA QUALITY FOR OCOG-OWNED LOGISTICS THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Transport of assets, materials and equipment	Low	Low	Medium	High
Energy consumption	Low	Low	Medium	High
Fuel consumption	Low	Low	Medium	High

- O&TS staff and contractor travel associated with the Games' project – based on staff and contractor travel distances to and from the project work, the mode(s) of transport they use and the number of times they visit the site.
  - It is likely that multiple modes of transport may be used to complete a journey, with this detail being even harder to capture. It is therefore reasonable to identify the mode of transport used to cover the most distance within the journey and use this as the predominant mode.
    - See section 8.1.6 for a data recording table template.
  - Games project-specific accommodation – based on the number of nights per stakeholder group per type of accommodation.
    - See section 8.1.10 for a data recording table template.

- O&TS materials and embodied carbon – based on the amount (kg/tonnes) per type of material (e.g. wood, plastic, metal, etc.) used.
  - See section 8.1.4 for a data recording table template.
    - If full details of all materials are not available, it is reasonable to identify the predominant material that makes up the asset, ideally by weight, and apply this to the calculation.
    - If data are not available for physical flows, it is possible to estimate GHG emissions based on financial flows. In this case, the list of data to be collected is much shorter, but the accuracy of a carbon footprint calculated based on financial flows is generally lower than a carbon footprint calculated with physical flows. See section 8.1.8 for a data recording table template.
    - If O&TS assets are rented, apply the methodology described in section 9.2. If bio-based materials (e.g. bamboo, wood, etc.) are used, apply the methodology described in section 9.3.

- Staff uniforms manufactured specifically for the Games period – follow data collection guidance set out in section 7.1.8.

For more detailed reporting, the data can be split by venue.

Expected data quality through carbon footprint iterations can be found below in Table 11. For data quality definitions, see section 4.2.3.

7.1.3.3 Emission factors

If GHG emissions are calculated based on physical flows, the Inventory of Carbon and Energy (ICE) Database is a useful source of relevant emission factors.

If GHG emissions are calculated based on financial flows, a number of databases are available with geographically relevant emission factors. They include (but are not limited to) the following:

- Greenhouse gas footprint indicators (Organisation for Economic Co-operation and Development; OECD)

- Ecoinvent Database

Please also refer to section 9.4, which explains how to take account of inflation and currency conversion rates so that emission factors are applied accurately in present-day values.

7.1.4 Look of the Games

7.1.4.1 Category description

This category includes activities associated with dressing Games venues and public areas across the Games host city/region and any co-host cities with a single brand identity, the "Look of the Games", where the OCOG is responsible for sourcing and delivery. The Look programme typically includes flags, banners, fence coverings, building wraps, facias and decals.

This category includes:

- Materials and embodied carbon associated with the Games project.

- Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues.

- Waste generated (through build and breakdown), where the "Look of the Games" supplier is responsible for handling the waste[11].

TABLE 11: EXPECTED DATA QUALITY FOR OVERLAY AND TEMPORARY STRUCTURES THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
O&TS transport of assets, materials and equipment	Low	Low	Medium	High
O&TS fuel consumption	Low	Low	Medium	High
O&TS waste generated on site (if relevant)	Low	Low	Low	High
O&TS staff and contractor travel	Low	Low	Medium	Medium
O&TS materials and embodied carbon	Low	Low	Low	Medium
Staff uniforms	Low	Low	Low	High

- Staff and contractor travel associated with the Games project, as well as any specific Games project accommodation provided to staff/contractors by the supplier.

Not included in this category:

The OCOG may develop a common template and "kit of parts" for municipal authorities to create their own Games-branded dressing for their respective towns and cities in the host country, conforming to the brand identity requirements of the Look programme. It may be difficult to obtain accurate data on materials used in this way. Therefore, any Games-branded dressing for which the OCOG provides guidelines but is not responsible for sourcing or delivery should be included in "Associated activities: City operations" (see section 7.3.6).

7.1.4.2 Data to be collected
GHG emissions generated by the category "Preparations and operations: Look of the Games" are calculated based on the accumulation of each activity.

- Materials and embodied carbon – based on the amount (kg/tonnes) per type of material (e.g. vinyl, polyester, LED screens/boards, etc.).
  - See section 8.1.4 for a data recording table template.

- Transport of assets, materials and equipment are calculated based on either:
  - the weight of material transported multiplied by the total distance travelled (expressed in tonne.km); or
  - the total distance travelled per mode of transport (expressed in km or miles).
    - See section 8.1.5 for a data recording table template.

- Waste generated (through build and breakdown), where the "Look of the Games" supplier is responsible for handling the waste – based on the total amount of waste generate per waste stream through the site build and breakdown.
  - See section 8.1.2 for a data recording table template.

- Staff and contractor travel associated with the Games project – based on staff and contractor travel distances to and from the project work, the mode(s) of transport they use and the number of times they visit the site.
  - See section 8.1.6 for a data recording table template.
  - Games project-specific accommodation – based on the number of nights per stakeholder group per type of accommodation.
    - See section 8.1.10 for a data recording table template.

Expected data quality through carbon footprint iterations can be found below in Table 12. For data quality definitions, see section 4.2.3.

7.1.4.3 Emission factors
Use supplier-specific emission factors, or emission factors that are specific to the selected database for this category (for example, the Environmental Impact Evaluation of Branding and signage solution for events). The ICE Database is also a useful source of relevant emission factors.

7.1.5 Energy use

7.1.5.1 Category description
This category includes energy use for the entire period when competition and non-competition venues are under the OCOG's operational control. These periods should correspond to the periods covered by the respective venue use agreements for each site, which will include:

- Sport competition venues.
- Sport non-competition (training) venues.
- Media and broadcast venues (IBC, MPC and ancillary media facilities).
- Olympic Village(s).
- Fan villages.
- Other support venues (e.g. transport depots, warehouses[12], server centres, uniform distribution and accreditation centre(s), torch relay sites, ceremony studios and rehearsal sites, etc.).

TABLE 12: EXPECTED DATA QUALITY FOR LOOK OF THE GAMES THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Materials and embodied carbon	Low	Low	Medium	High
Transport of assets, materials and equipment	Low	Low	Medium	High
Waste generated	Low	Low	Medium	High
Staff and contractor travel	Low	Low	Medium	Medium

11 It is important to note that if the "Look of the Games" supplier is not responsible for handling the waste from "Look" materials, the supplier still has a responsibility to minimise, through design and planning, the volumes of waste likely to be created.

12 OCOG warehouse energy consumption may also be included in "Other support venues" for reporting, but for the purposes of data collection it is identified in the "OCOG logistics" category.

This category includes:

- Grid power – energy consumed from national grid infrastructure (e.g. electricity, natural gas, heat, steam, etc.). The purchase of renewable energy (e.g. through power purchase agreements (PPAs) or renewable energy certificates (RECs)) should also be recorded here[13]. In addition, venues may have their own on-site renewable energy generation (e.g. solar panels). Energy consumed via this means should be recorded and reported.

- Temporary power – fuel used to power generators and other temporary power equipment.

- Transport of assets, materials and equipment related to temporary power.

- Waste generated (through build and breakdown), where the energy supplier is responsible for handling the waste (e.g. cabling)[14].

7.1.5.2 Data to be collected

GHG emissions related to venue energy use are calculated based on the type and amount of energy used on site. Key sources of energy for which to collect data include:

- Grid-sourced energy – based on the total amount of energy consumed for each type of grid-sourced energy (e.g. electricity, natural gas, heat, etc.).

- On-site renewable energy – based on the total amount of energy consumed from on-site renewable energy generation (e.g. solar panels, wind turbines, etc.).

- Market-based energy – based on the total amount of renewable energy consumed across the reporting period (with evidence from a PPA or REC).
  - See section 8.1.1 for a data recording table template.
  - See sections 9.1 and 9.3 for guidance on reporting the production and purchase of renewable energy and biofuels.

- Temporary power – based on the total consumption of each type of fuel (e.g. diesel, petrol, biodiesel, etc.).
  - See section 8.1.1 for a data recording table template.

- Transport of assets, materials and equipment related to temporary power – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne. km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.

- Waste generated (through build and breakdown), where the energy supplier is responsible for handling the waste – based on - the total amount of waste generated per waste stream through build and breakdown.
  - See section 8.1.3 for a data recording table template.

Where possible, record data for each venue separately. In some cases, it may be difficult to obtain actual energy use figures if collection of this data has not been specified in the venue use agreement(s). Thus, even in situations where the OCOG is renting a venue and energy costs are integrated into the overall hire fee, there should still be a requirement for energy data covering the entire exclusive use period.

If there are periods of non-exclusive use – for example, if overlay is installed while the venue owners are still using the site for other purposes – it may be impractical to capture energy use data specific to Games activity. If it is possible to obtain or calculate such granularity of data, then it should be included. If it is not practical to obtain or calculate the data for this time period, it is usually not a material gap, but it is worth being aware of and noting.

Expected data quality through carbon footprint iterations can be found below in Table 13. For data quality definitions, see section 4.2.3.

TABLE 13: EXPECTED DATA QUALITY FOR ENERGY USE THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Grid power	Low	Low	Medium	High
Temporary power	Low	Low	Medium	High
Transport of assets, materials and equipment	Low	Low	Medium	High
Waste generated	Low	Low	Medium	High

13 It is best practice to include both a location-based and a market-based method when reporting. "A location-based method reflects the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data). A market-based method reflects emissions from electricity that companies have purposefully chosen (or their lack of choice)" – GHG Protocol Scope 2 Guidance. See also section 9.1.

14 It is important to note that if the energy supplier is not responsible for handling the waste from energy operations, the supplier still has a responsibility to minimise, through design and planning, the volumes of waste likely to be created.

7.1.5.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

The emission factor or calculation used for the consumption of diesel, natural gas or other energy sources must account for the extraction, refining and transportation of the raw fuels ("cradle-to-gate" or "well-to-tank") and combustion at the point of use.

The emission factor or calculation used for electricity consumption must also account for the transmission and distribution ("cradle-to-gate") from generation to the point of use.

7.1.6 Sports equipment

7.1.6.1 Category description
This category includes the manufacture of sports equipment and the transport of this sports equipment to OCOG warehouses and venues. All sports equipment organised by the OCOG, both bought and value-in-kind, is included in this category.

This category includes:

- Materials and embodied carbon associated with sport equipment.
- Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues.
- Transport of large sports equipment items that have special transport requirements and must travel separately from teams (e.g. horses, boats, etc.).

Not included in this category:

- Sports equipment transported from OCOG warehouses to venues (included in "Preparations and operations: OCOG logistics"; see section 7.1.2).

7.1.6.2 Data to be collected
GHG emissions generated by the category "Preparations and operations: Sports equipment" should cover activities related to all sub-categories.

There is a large volume of sports equipment procured for the Games, and it is currently rare to find specific life cycle assessment (LCA) information or readily available breakdowns of weights and materials. Therefore, it is unlikely that high data quality will be available for all Games sports equipment. It is also worth noting that much of the sport equipment used is specified by the International Federations (IFs) via sole suppliers. IFs should be encouraged to source and record more details of this type, and early dialogue with IFs may support the capture of better data.

Where there are no physical flows of data available, or where it is prohibitively resource-intensive to locate and estimate physical flows of data, it is possible to estimate GHG emissions based on financial flows. In this case, the list of data to be collected is much shorter, but the accuracy of a carbon footprint calculated based on financial flows is generally lower than a carbon footprint calculated with physical flows.

- See section 8.1.8 for a data recording table template.

In some cases, however, higher-quality data may be available. It may also be reasonable to focus resources on gaining higher-quality data for sports equipment that is expected to have the greatest material emissions impact (e.g. items being bought new or being sourced from the furthest distances away). In these cases, types of data to collect include:

- Materials and embodied carbon associated with sports equipment – based on the amount per type of material (e.g. wood, plastic, metal, etc.).
  - See section 8.1.4 for a data recording table template.
- Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne.km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.
- Transport of large sports equipment items that travels separately to teams – based on the weight of material transported multiplied by the total distance travelled (expressed in tonne.km).
  - See below further guidance on specific large sports equipment transport.
  - See section 8.1.5 for a data recording table template.

For sports equipment assets bought new for the Games, all emissions should be attributed to the Games, even if there will be a legacy use post-Games. If assets are leased or rented for the Games, apply the methodology described in section 9.2.

Further guidance on specific large sports equipment transport: Horses and competition boats
GHG emissions related to transport are calculated based on the weight of material transported multiplied by the total distance travelled (expressed in tonne.km). In most cases, goods transportation is modelled on the default assumption that loads are limited by weight on board. But in cases of low-density "goods", such as horses or competition boats, the limitations come from volume. This supposedly happens at a density below 250kg/m^3 for trucks, below 150kg/m^3 for planes, and below 400kg/m^3 for cargo ships[15]. In such cases, a factor reflecting the increase of number of trucks or planes needed for the same tonne.km service must be adopted. This is called "large volume factor" (LVF).

Weight [tonnes] *Large volume factor [-] *distance [km]
= x [tonne * km]

15 Those limits of density were calculated based on the average load capacity of the vehicle (truck, plane or freight ship) expressed in tonnes or kg divided by its average storage volume available.

- Transport of horses

For modelling the transport of horses by plane and by truck, use Table 14 below.

TABLE 14: DEFAULT DATA FOR TRANSPORT OF HORSES

Parameter	Value
Average weight per horse (including additional material of the horse)	1 tonne
Large volume factor to apply to transport of horses by plane (expressed in tonne.km)*	1.5
Maximum number of horses in one truck 32t	8 horses/truck

**Considering an average weight of 1 tonne per horse (and additional material) and an average volume of 10m³ per horse (container of 3.18 * 2.44 * 2.44 for two to three horses plus additional material), the density for the transport of horses by plane is 1,000 [kg]/10 [m³] = 100 [kg/m³]. The transport by plane is therefore considered to be "volume-limited", and a corrective factor of 150 [kg/m³]/100 [kg/m³] must be applied.*

EXAMPLE FOR THE TRANSPORT OF HORSES BY PLANE
If 200 horses are transported to the Games by plane, each travelling a distance of 10,000km, the value to consider for calculating GHG emissions is:

200 [horses] * 1 [tonne/horse] * 1.5 * 10,000 [km] = 3,000,000 [tonne.km]

GHG emissions of transport of horses by truck should be calculated based on total distance travelled by trucks rather than based on weight multiplied by distance per trip, using the maximum number of eight horses per truck.

EXAMPLE FOR THE TRANSPORT OF HORSES BY TRUCK
If 100 horses are transported to the Games by truck, each travelling a distance of 500km, the value to consider for calculating GHG emissions is:

100 [horses] / 10 [horses/vehicle] * 500 [km] = 5,000 [vehicle.km]

- Transport of competition boats

For modelling the transport of competition boats by cargo ship and by truck, use the default data in Table 15 below.

TABLE 15: DEFAULT DATA FOR TRANSPORT OF COMPETITION BOATS

Parameter	Value
Average weight of sailing boats	0.3 tonnes
Average weight of rowing and canoe boats	0.1 tonnes
Density for the transport of competition boats by cargo ship	200 [kg/m³]
Large volume factor to apply to transport of competition boat by cargo ship*	2
Large volume factor to apply to transport of competition boat by truck	1.25

**The density for the transport of competition boats by cargo ship is 200 [kg/m³]. The transport by cargo ship is therefore considered to be "volume-limited", and a corrective factor of 400 [kg/m³]/200 [kg/m³] must be applied.*

EXAMPLE FOR THE TRANSPORT OF SAILING BOATS BY FREIGHT SHIP
If 100 sailing boats are transported to the Games by freight ship, each travelling a distance of 15,000km, the value to consider for calculating GHG emissions of transport by freight ship of competition boats is:

100 [sailing boats] * 0.3 [tonne/boat] * 2 * 15,000 [km] = 900,000 [tonne.km]

Expected data quality through carbon footprint iterations can be found below in Table 16. For data quality definitions, see section 4.2.3.

TABLE 16: EXPECTED DATA QUALITY FOR SPORTS EQUIPMENT THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	Initial	Reference	Revised	Actual
Materials and embodied carbon	Low	Low	Low	Low to medium
Transport of assets, materials and equipment	Low	Low	Low	Low to medium
Transport of large sports equipment	Low	Low	Medium	Medium

7.1.6.3 Emission factors
If GHG emissions are calculated based on financial flows, a number of databases are available with geographically relevant emission factors. They include (but are not limited to) the following:

- Greenhouse gas footprint indicators (OECD)
- Ecoinvent Database

Please also refer to section 9.4, which explains how to take account of inflation and currency conversion rates so that emission factors are applied accurately in present-day values.

7.1.7 Electronic equipment and IT services

7.1.7.1 Category description
This category includes all electronic devices, including data servers, that are used by staff, technicians and officials to prepare and host the Games.

This category includes:

- Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues.
- Materials and embodied carbon associated with the Games project.

Not included in this category:

- The transport of electronic equipment from OCOG warehouses to venues (included in "Preparations and operations: OCOG logistics"; see section 7.1.2).

7.1.7.2 Data to be collected
GHG emissions relative to electronic equipment should cover all category activities. Some equipment manufacturers may produce product LCAs that relate directly to the product or provide an adequate proxy. In the absence of a suitable LCA, the emissions are calculated based on the accumulation of each activity:

- Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne. km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.
- Materials and embodied carbon – based on electrical equipment type and item weights.
  - See section 8.1.4 for a data recording table template.

As per other categories which include many different types of items, it is unlikely that high data quality will be available for all Games electronic equipment and IT services. Where there are no physical flows of data available, or it is prohibitively resource-intensive to locate and estimate physical flows of data, it is possible to estimate GHG emissions based on financial flows. See section 8.1.8 for a data recording table template.

If assets are leased or rented for the Games, apply the methodology described in section 9.2.

Expected data quality through carbon footprint iterations can be found below in Table 17. For data quality definitions, see section 4.2.3.

7.1.7.3 Emission factors
Use supplier-specific LCA emission factors, country-specific emission factors and/or emission factors specific to the selected database (e.g. "Electrical items" under "Material use" from UK Government conversion factors for company reporting of GHG emissions; or "Digital" from Impact CO_2).

Please also refer to section 9.4, which explains how to take account of inflation and currency conversion rates so that the emission factors are applied accurately in present-day values.

7.1.8 Uniforms

7.1.8.1 Category description
This category includes all uniforms funded by the OCOG: uniforms provided to the workforce (staff and volunteers) and other OCOG-approved uniforms, such as bibs provided to accredited media.

This category includes:

- Materials and embodied carbon associated with uniforms funded by the OCOG.
- Transport of assets, materials and equipment from manufacturers/suppliers to OCOG warehouses and venues.

Not included in this category:

- Costumes used for ceremonies (included in "Preparations and operations: Ceremonies"; see section 7.1.11).

TABLE 17: EXPECTED DATA QUALITY FOR ELECTRONIC EQUIPMENT AND IT SERVICES THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Transport of assets, materials and equipment	Low	Low	Low	Low to medium
Materials and embodied carbon	Low	Low	Low	Low to medium

- The energy provision of the uniform/accreditation centre (included in "Preparations and operations: Energy use"; see section 7.1.5).

- Uniforms paid for by other entities, such as NOCs (included in "Associated activities: Uniforms (other)"; see section 7.3.1).

- Transport of uniforms from OCOG warehouses to the Uniform and Accreditation Centre(s) and venues (included in "Preparations and operations: OCOG logistics"; see section 7.1.2).

7.1.8.2 Data to be collected
GHG emissions for uniforms are calculated as follows:

- Materials and embodied carbon associated with uniforms funded by the OCOG – based on type of textile, weight of item and total number of uniforms.
  - See section 8.1.4 for a data recording table template.

- Transport of assets, materials and equipment from manufacturers/suppliers to OCOG warehouses and venues – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne.km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.

If natural fibres are used (e.g. bamboo, cotton fibres, etc.), apply the methodology described in section 9.3.

Expected data quality through carbon footprint iterations can be found below in Table 18. For data quality definitions, see section 4.2.3.

7.1.8.3 Emission factors
Use supplier-specific life cycle emission calculations or emission factors specific to the database selected for this category. Clothing manufacturers of OCOG-funded uniforms should produce product LCAs that relate directly to the product. However, industry-average LCAs may also be available.

7.1.9 Merchandise

7.1.9.1 Category description
This category includes all licensed Olympic and Paralympic merchandise, and includes the following activities:

- Materials and embodied carbon associated with merchandise items and packaging.

- Transport of merchandise items from manufacturers/suppliers to OCOG warehouses and retail units.

Not included in this category:

- Transport of merchandise from OCOG warehouses to Games retail units (included in "Preparations and operations: OCOG logistics"; see section 7.1.2).

- The energy provision of retail units (included in "Preparations and operations: Energy use"; see section 7.1.5).

7.1.9.2 Data to be collected
GHG emissions of merchandise activities are calculated as follows:

- Materials and embodied carbon associated with merchandise items and packaging – based on the amount per type of material (e.g. textile, metal, plastic, etc.). If bio-based materials are used (e.g. bamboo, cotton fibres, etc.), apply the methodology described in section 9.3.
  - Suppliers should be asked for this data as a priority. If they cannot provide the data, it is possible to do an audit of items in the retail stores to better understand materials and weights of items. Alternatively, if the number of items is known, then standard emission factors may exist on a per-item basis.
    - See section 8.1.4 for a data recording table template.
    - See section 8.2 for emission factor sources.

- Transport of merchandise items from manufacturers/suppliers to OCOG warehouses and retail units – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne.km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.

As with sports equipment, there are a high number and a wide range of items covered within merchandise. It is currently rare to find specific LCA information, or for suppliers to offer a readily available breakdown of item weights and materials. It is encouraged that higher data quality is sought in a targeted way and aligned to guidance above, but this is unlikely to be possible for all items.

TABLE 18: EXPECTED DATA QUALITY FOR UNIFORMS THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Materials and embodied carbon	Low	Low	Medium	High
Transport of uniforms from manufacturers/ suppliers to OCOG warehouses and venues	Low	Low	Medium	High

Where physical flows of data are not available, and it is prohibitively resource-intensive to locate and estimate physical flows of data, it is possible to estimate GHG emissions based on financial flows. See section 8.1.8 for a data recording table template.

Expected data quality through carbon footprint iterations can be found below in Table 19. For data quality definitions, see section 4.2.3.

7.1.9.3 Emission factors
Use emission factors specific to the database selected for this category. For clothing/apparel, industry-average LCAs may be available.

7.1.10 Catering

7.1.10.1 Category description
This category includes food and beverage (F&B) for workforce, athletes, broadcast and media, and spectators delivered inside the Games perimeter, and includes the following related activities:

- Production and preparation of food for serving.
- Provision of alcoholic and non-alcoholic beverages.
- Transport of F&B from suppliers to the Games perimeter.
- F&B staff and contractor travel associated with Games perimeter catering, as well as any Games project-specific accommodation provided to staff by suppliers.
- Production and delivery of F&B packaging.
- Staff uniforms, provided by the OCOG and manufactured specifically for the Games period for catering serving staff.

Not included in this category:

- Energy used to prepare and store food (e.g. cooking, refrigeration, etc.) within the Games perimeter (included in "Preparations and operations: Energy use"; see section 7.1.5).
- Catering waste generated on site within the Games perimeter (included in "Preparations and operations: Waste management"; see section 7.1.13).
- Breakfasts taken at hotels (included in "Preparations and operations: Accommodation" and "Associated activities: Accommodation (spectators, NOCs, other)"; see sections 7.1.17 and 7.3.4 respectively).
- Meals purchased outside the Games perimeter – for example, in local restaurants.

7.1.10.2 Data to be collected
GHG emissions are calculated as follows:

- Production and preparation of food for serving, provision of alcoholic and non-alcoholic beverages – based on the number of meals served per type of meal (e.g. red meat-based, white meat-based, fish-based, vegetarian, sandwiches, soft drinks, alcoholic drinks, etc.).
  - See section 8.1.4 for a data recording table template.
- Transport of F&B from suppliers to the Games perimeter – based on the distance travelled for delivery of F&B and the transport mode.
  - See section 8.1.5 for a data recording table template.
- F&B staff and contractor travel associated with Games perimeter catering – based on staff and contractor travel distances to and from the project work, the mode of transport they use and the number of times they are on site.
  - It is likely that some staff and contractors may use multiple modes of transport to complete a journey, with this detail being even harder to capture. It is therefore reasonable to identify the mode of transport used to cover the most distance within the journey and use this as the predominant mode.
    - See section 8.1.6 for a data recording table template.
  - Games project-specific accommodation – based on the number of nights per stakeholder group, per type of accommodation.
    - See section 8.1.10 for a data recording table template.
- Production and delivery of F&B packaging – based on the amount per type of material (e.g. cardboard, plastic, etc.).
  - See section 8.1.4 for a data recording table template.
- Staff uniforms, provided by the OCOG and manufactured specifically for the Games period for catering serving staff – follow data collection guidance set out in section 7.1.8.

For more detailed reporting, it is recommended that calculated emissions are split into several subcategories. For example:

- Catering at Olympic Village(s)
- Catering per venue
- Catering per stakeholder group (e.g. athletes, workforce, media, etc.)

TABLE 19: EXPECTED DATA QUALITY FOR MERCHANDISE THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Materials and embodied carbon	Low	Low	Low	Medium
Transport of merchandise items from manufacturers/suppliers to OCOG warehouses and retail units	Low	Low	Low	Medium

- Catering sold to spectators within the Games perimeter

Expected data quality through carbon footprint iterations can be found below in Table 20. For data quality definitions, see section 4.2.3.

7.1.10.3 Emission factors
Use supplier-specific emission factors (e.g. if suppliers use carbon labelling software). Otherwise, use the default data and default emission factors provided in section 8.2.

7.1.11 Ceremonies

7.1.11.1 Category description
This category includes all activities necessary for staging the opening, closing and victory ceremonies organised by the OCOG, and includes the following related activities:

- Materials and embodied carbon associated with all ceremonies' consumables (e.g. medals, podiums, costumes, stages, decor, etc.).

- Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues.

- Energy and fuel consumption relating to the preparation and rehearsal of the ceremonies in locations other than the final venue, as well as any fuel required in specific equipment (e.g. pyrotechnics).

- Ceremonies performers' travel associated with the Games project, as well as any Games project-specific accommodation provided to performers outside of what is captured in "Preparations and operations: Accommodation (see section 7.1.17).

Not included in this category:

- Activities associated with Olympic and Paralympic torch relays (included in "Preparations and operations: Torch relays"; see section 7.1.12).

- Fuel consumption associated with the actual opening, closing and victory ceremonies (included in "Preparations and operations: Energy use"; see section 7.1.5).

- Overlay and temporary structures related to the wider Games, as well as ceremonies (included in "Preparations and operations: Overlay and temporary structures"; see section 7.1.3).

7.1.11.2 Data to be collected
GHG emissions are calculated as follows:

- Materials and embodied carbon associated with all ceremonies' consumables – based on the amount (kg/tonnes) per type of material (e.g. wood, plastic, metal, etc.) used.
  - See section 8.1.4 for a data recording table template.
    - If full details of all materials are not available, it is reasonable to identify the predominant material that makes up the asset, ideally by weight, and apply this to the calculation.
    - If data are not available for physical flows, it is possible to estimate GHG emissions based on financial flows. In this case, the list of data to be collected is much shorter, but the accuracy of a carbon footprint calculated based on financial flows is generally lower than a carbon footprint calculated with physical flows. See section 8.1.8 for a data recording table template.
    - If assets are rented, apply the methodology described in section 9.2. If bio-based materials (e.g. bamboo, wood, etc) are used, apply the methodology described in section 9.3.

- Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne. km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.

- Energy and fuel consumption relating to the preparation and rehearsal of the ceremonies in locations other than the final

TABLE 20: EXPECTED DATA QUALITY FOR CATERING THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Production and preparation of food for serving, provision of alcoholic and non-alcoholic beverages	Low	Low	Low	Medium to high
Transport of F&B from suppliers to the Games perimeter	Low	Low	Low	Medium to high
F&B staff and contractor travel	Low	Low	Low	Medium
Production and delivery of F&B packaging	Low	Low	Low	Medium to high
Staff uniforms, provided by the OCOG	Low	Low	Low	High

venue, as well as any fuel required in specific equipment (e.g. pyrotechnics) – based on the total amount of electricity and or fuel consumed for each type of fuel (e.g. gasoline, diesel, biodiesel, etc.) during rehearsals.
  - See section 8.1.1 for a data recording table template.

- Ceremonies performers' travel associated with the Games project – based on performers' travel distances to and from the project work, the mode of transport they use and the number of times they are on site.
  - It is likely that multiple modes of transport may be used to complete a journey, with this detail being even harder to capture. It is therefore reasonable to identify the mode of transport used to cover the most distance within the journey and use this as the predominant mode.
    - See section 8.1.6 for a data recording table template.
  - Games project-specific accommodation – based on the number of nights per stakeholder group, per type of accommodation.
    - See section 8.1.10 for a data recording table template.

Expected data quality through carbon footprint iterations can be found below in Table 21. For data quality definitions, see section 4.2.3.

7.1.11.3 Emission factors
Use emission factors specific to the database selected for this category.

There may not be LCA emission factors for all identified materials. In this case, it is reasonable to choose a similar material where there is an emission factor available and ensure this assumption is clearly documented.

7.1.12 Torch relays

7.1.12.1 Category description
This category primarily focuses on the Olympic torch relay (OTR), which has the most significant impacts, but should also account for GHG emissions relating to the Paralympic torch relay (PTR). It includes:

- Transport of the Olympic flame for the full OTR route – where it is lit in Olympia; the five- to six-day torch relay within Greece conducted by the Hellenic Olympic Committee and ending in Athens, where the Olympic flame is handed over to the OCOG; and its onward travel from Athens to the host country.
- Transport of the Paralympic Flame for the full PTR route – where it is lit in Stoke Mandeville in the UK; transport to the host country; and the relay conducted in the host country.
- Fuel consumption of vehicles accompanying the torchbearers (the caravan). If the caravan includes sponsor vehicles, they should also be included in this category.
- Travel and accommodation of the core team[16] during the torch relays.
- Catering for the core team during the torch relays.
- Production of the torches, celebration site cauldron(s) and Games-time cauldron(s).
- Consumption and combustion of fuel for the torch flames, celebration site cauldron(s) and Games-time cauldron(s).
- Staff and torchbearer uniforms, provided by the OCOG and manufactured specifically for the Games period.

TABLE 21: EXPECTED DATA QUALITY FOR CEREMONIES THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Materials and embodied carbon associated with all ceremonies' consumables	Low	Low	Low to medium	Medium to high
Transport of assets, materials and equipment from suppliers to OCOG warehouses and venues	Low	Low	Medium	Medium to high
Energy and fuel consumption	Low	Low	Medium	High
Ceremonies performers' travel	Low	Low	Low to medium	Medium

16 The "core team" are identified as those people who accompany the torch from place to place in order to ensure its safe passage and the core operations of the torch relays along the route.

- Costumes, provided by the OCOG and manufactured specifically for the torch relays.

- Production and consumption of goods and services during the torch relays (e.g. relevant equipment, entertainment, products and packaging such as from partner giveaways, etc.).

- Transport of torchbearers from their homes to the relay route(s) (optional).

Not included in this category:

- Transport of spectators to the relay route(s) (included in "Associated activities: Travel to torch relays (spectators, other)"; see section 7.3.3).

- Fuel and energy consumption (e.g. power, cooling, etc) associated with the torch relays (included in "Preparations and operations: Energy use"; see section 7.1.5).

7.1.12.2 Data to be collected
GHG emissions are calculated as follows:

- Transport of the Olympic flame for the full OTR, and of the Paralympic Flame for the full PTR route – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne.km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.

- Fuel consumption of vehicles accompanying the torchbearers (the caravan) – based on either:
  - the total fuel consumption by all the caravan vehicles; or
  - the total distance of the route and the number of vehicles per type of vehicle (e.g. cars, buses, motorcycles, etc.).
    - See section 8.1.10 for a data recording table template.
    - If no primary data are available for the total distance travelled by the fleet, a default distance should be estimated based on likely locations that will be visited and the distances between them.

- Travel and accommodation of the core team during the torch relays – based on the total distance travelled, per person, per mode of transport used, and the total number of room nights, per country.
  - It is likely that multiple modes of transport may be used to complete a journey, with this detail being even harder to capture. It is therefore reasonable to identify the mode of transport used to cover the most distance within the journey and use this as the predominant mode.
    - See section 8.1.10 for a data recording table template.

- Catering for the core team during the torch relays – based on the total number of meals consumed (excluding breakfast, which is included within room nights). This can be assessed by taking into account the total number of days of the torch relays and the number of people in the core team.
  - See section 8.1.9 for a data recording table template.

- Production of the torches, celebration site cauldron(s) and Games-time cauldron(s) – based on the total amount of materials used to produce all the torches.
  - See section 8.1.4 for a data recording table template.

- Consumption and combustion of fuel for the torch flames, celebration site cauldron(s) and Games-time cauldron(s) – based on amount of fuel used.
  - See section 8.1.1 for a data recording table template.

- Staff and torchbearer uniforms – follow data collection guidance set out in section 7.1.8.

- Production and consumption of goods and services during the torch relays – likely to include equipment, packaging and products used in giveaways. Data may include the total amount/volume of product used including material type.
  - See section 8.1.4 for a data recording table template.
  - There will also be other torch relay spend that is not captured in other categories (e.g. entertainment services, food and beverage service fees, etc.). In these instances, where it is not feasible to collect more accurate data due to time and resource constraints, finance data can be used. See section 8.1.8 for a data recording table template.

- Optional: transport of torchbearers from their homes to the relay route(s) – based on the total number of torchbearers and the distance from their homes to the relay route(s), per mode of transport.
  - If data relating to all torchbearers is not available, then target data collection for those torchbearers who are expected to travel the greatest distances – particularly by plane, as they will be the most material sources of torchbearer emissions.

Expected data quality through carbon footprint iterations can be found below in Table 22. For data quality definitions, see section 4.2.3.

7.1.12.3 Emission factors
The emission factor or calculation used for the consumption of diesel, natural gas and other energy sources must account for the extraction, refining and transportation of the raw fuels ("cradle-to-gate" or "well-to-tank") and combustion at the point of use.

The emission factor or calculation used for electricity consumption must also account for the transmission and distribution ("cradle-to-gate") from generation to the point of use.

For catering for the core team, when default data provided above are used, apply the emission factors provided in section 8.2. Please note that these data can be used only for the initial carbon footprint. Primary data and corresponding emission factors must be collected to calculate the actual carbon footprint.

For torchbearers' plane transport, use the emission factors provided in section 8.2.

For other activities, use country-specific emission factors and/or emission factors specific to the database selected for this category.

TABLE 22: EXPECTED DATA QUALITY FOR TORCH RELAYS THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Transport of the Olympic flame for the full OTR, and of the Paralympic flame for the full PTR route	Low	Low	Medium	High
Fuel consumption of vehicles accompanying the torchbearers (the caravan)	Low	Low	Medium	High
Travel and accommodation of the core team during the torch relays	Low	Low	Medium	High
Catering for the core team during the torch relays	Low	Low	Medium	Medium
Production of the torches, celebration site cauldron(s) and Games-time cauldron(s)	Low	Low	Low to medium	High
Consumption and combustion of fuel for the torch flames, celebration site cauldron(s) and Games-time cauldrons	Low	Low	Low to medium	Medium to high
Staff and torchbearer uniforms	Low	Low	Low to medium	High
Production and consumption of goods and services during the torch relays	Low	Low	Low	Low
Optional – Transport of torchbearers from home to relay route	Low	Low	Low	Low

7.1.13 Waste management

7.1.13.1 Category description
This category includes the generation and disposal of the different streams of waste, and the transport of waste from OCOG-managed Games sites to treatment locations.

7.1.13.2 Data to be collected
GHG emissions are calculated as follows:

- Waste generation and disposal – based on the amount (tonnes) of waste, per waste stream and the type of treatment (recycling, landfilling, incineration).
  - See section 8.1.2 for a data recording table template.
  - If primary data are not available, use the national rates for the different types of waste treatment.
- Transport of waste to treatment locations – based on the mode of transport and the distance travelled.
  - See section 8.1.5 for a data recording table template.

Expected data quality through carbon footprint iterations can be found below in Table 23. For data quality definitions, see section 4.2.3.

7.1.13.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

TABLE 23: EXPECTED DATA QUALITY FOR WASTE MANAGEMENT THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Waste generation and disposal	Low	Low	Low	High
Transport of waste to treatment locations	Low	Low	Low	High

7.1.14 OCOG-coordinated security

7.1.14.1 Category description
This category includes all activities associated with OCOG-procured security services, including:

- Vehicles used by security.
- Staff and contractor travel associated with the Games project, as well as any Games project-specific accommodation provided to staff by suppliers.
- Security equipment and assets.
- Transport of security equipment and assets related to the Games project.
- Staff uniforms manufactured specifically for the Games period, including high-visibility jackets and PPE.

Not included in this category:

- Activities associated with local, regional and national state security operations (included in "Associated activities: City operations"; see section 7.3.6).

7.1.14.2 Data to be collected
GHG emissions are calculated as follows:

- Vehicles used by security – based on the total distance travelled by security vehicles or total fuel consumption of security vehicles and based on the production of security equipment
  - See section 8.1.10 for a data recording table template.
- Staff and contractor travel – based on staff and contractor travel distances to and from the project work, the mode of transport they use and the number of times they are on-site.
  - It is likely that multiple modes of transport may be used to complete a journey, with this detail being even harder to capture. It is therefore reasonable to identify the mode of transport used to cover the most distance within the journey and use this as the predominant mode.
    - See section 8.1.6 for a data recording table template.
- Security equipment and assets – based on the amount (kg/tonnes) per type of material (e.g. wood, plastic, metal, etc.) used.
  - See section 8.1.4 for a data recording table template.
- GHG emissions of purchased equipment, for which 100 per cent of GHG emissions related to the production must be allocated to the Games, and of rented equipment, which will be used on several other occasions during and after the Games, must be done according to section 9.2.
- Transport of security equipment and assets – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne. km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.
- Staff uniforms manufactured specifically for the Games period – follow data collection guidance set out in section 7.1.8.

As with some other categories, security equipment and assets cover a high number and a wide range of items. It is also currently rare to find specific LCA information, or for suppliers to provide a readily available breakdown of item weights and materials. It is encouraged that higher data quality is sought, in a targeted way and aligned to guidance above, but it is also acknowledged that this is unlikely to be possible for all items. Where physical flows of data are not available and it is prohibitively resource-intensive to locate and estimate physical flows of data, it is possible to estimate GHG emissions based on financial flows.
- See section 8.1.8 for a data recording table template.

Expected data quality through carbon footprint iterations can be found below in Table 24. For data quality definitions, see section 4.2.3.

7.1.14.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

Please also refer to section 9.4, which explains how to take account of inflation and currency conversion rates so that the emission factors are applied accurately in present-day values.

TABLE 24: EXPECTED DATA QUALITY FOR OCOG-COORDINATED SECURITY THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	Initial	Reference	Revised	Actual
Vehicles used by security	Low	Low	Low	High
Staff and contractor travel	Low	Low	Medium	Medium
Security equipment and assets	Low	Low	Low	Low to medium
Transport of security equipment and assets	Low	Low	Medium	High
Staff uniforms	Low	Low	Low	Low to medium

7.1.15 OCOG-provided ground transport

7.1.15.1 Category description
This category includes all ground transportation provided for accredited stakeholders organised or paid for by the OCOG at Games time:

- Ground transportation provided by the OCOG at Games time – vehicles for accredited stakeholders to travel between competition and non-competition venues. Stakeholders using this service include athletes, IF officials and media (non-comprehensive list).

Not included in this category:

- Business travel of OCOG employees and associates related to OCOG activity from the OCOG's inception to its dissolution (included in "Preparations and operations: Office headquarters"; see section 7.1.1).
- The use of other transport solutions by wider stakeholder groups (included in "Preparations and operations: OCOG-related workforce travel to venues" and "Associated activities: Travel to the host country and to venues (NOCs, spectators, other)"; see sections 7.1.16 and 7.3.2 respectively).
- Games delivery partner in-bound travel to the Games host city/region before Games time, such as attendance at Chef de Mission Seminars and World Press Briefings (included in "Associated activities: Travel to the host country and to venues (NOCs, spectators, other)"; see section 7.3.2).

7.1.15.2 Data to be collected
GHG emissions are calculated as follows:

- Ground transportation provided by the OCOG at Games time – based on the total distance travelled during the Games by each type of vehicle.
  - See section 8.1.10 for a data recording table template.
  - For any plug-in hybrid or battery electric vehicles, which are charged using OCOG-owned temporary or venue fixed power supply, ensure that this is not double-counted via the category "Preparations and operations: Energy use".

If biofuels are used, apply the methodology described in section 9.3.

Expected data quality through carbon footprint iterations can be found below in Table 25. For data quality definitions, see section 4.2.3.

7.1.15.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

The emission factor used for the consumption of diesel or other fuels must account for the production and the combustion of those fuels on site.

7.1.16 OCOG-related workforce travel to venues

7.1.16.1 Category description
This category includes OCOG-related workforce (staff, contractors and volunteers) travel to Games venues and their working locations during Games time:

- Travel and transport of OCOG staff, contractors and volunteers in and around the Games host city/region using non-OCOG-provided ground transport (i.e. private and public transport).

Not included in this category:

- Employee commuting and homeworking before the Games (included in "Preparations and operations: Office headquarters"; see section 7.1.1).
- Ground transportation services provided by the OCOG at Games time (included in "Preparations and operations: OCOG-provided ground transport"; see section 7.1.15).
- Transport and accommodation of key suppliers and contractors (included in other categories within "Preparations and operations").
- Travel and transport for volunteers originating from outside the Games host city/region, national and international (included in "Associated activities: Transport to the host country and to venues (NOCs, spectators, other)"; see section 7.3.2).
- Accommodation for volunteers (included in "Associated activities: Accommodation (spectators, NOCs, other)"; see section 7.3.4).
- The use of public transport around the Games host by media, broadcast personnel, spectators and other groups (included in "Associated activities: Transport to the host country and to venues (spectators, NOCs, other)"; see section 7.3.4).

TABLE 25: EXPECTED DATA QUALITY FOR OCOG-PROVIDED GROUND TRANSPORT THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Ground transportation provided by the OCOG at Games time	Low	Low	Medium	High

7.1.16.2 Data to be collected
GHG emissions are calculated as follows:

- Travel and transport of OCOG staff, contractors and volunteers in and around the Games host city/region using non-OCOG-provided ground transport (i.e. private and public transport) – based on the total number of people travelling to competition and non-competition venues, the mode of transport and the average distance travelled to their workplace, i.e. number of persons multiplied by the distance they travelled by mode of transport, hence person * km, denoted p.km or person.km.
  - See section 8.1.6 for a data recording table template.

To complete the calculation within the parameters outlined above, it will be necessary to make some assumptions, given the large size of the workforce. Guidance on the types of assumptions and potential information sources to inform these assumptions is provided below in Table 26.

Expected data quality through carbon footprint iterations can be found below in Table 27. For data quality definitions, see section 4.2.3.

7.1.16.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

7.1.17 Accommodation

7.1.17.1 Category description
This category includes the number of nights spent in accommodation (e.g. hotels, bed and breakfasts, apartments, wider non-standard accommodation such as university accommodation, etc.) that were reserved by the OCOG during Games time (e.g. IOC Members, guests, workforce, media, broadcast, VIP delivery partners, etc.).

TABLE 26: TYPES OF ASSUMPTIONS TO INFORM OCOG-RELATED WORKFORCE TRAVEL TO VENUES

Parameter	What you need to know	The question you're trying to answer	Sources of insight to inform assumptions
Number of people/journeys around the region	The total number of journeys being undertaken	How many people per stakeholder group will be travelling to the Games, daily and over the Games timeframe?	• OCOG FA: Workforce • Local authority transport demand modelling • Post-event survey
Mode(s) of transport used within the region	The mode(s) of transport used[17]	What types of transport are people are using to get to their destinations, and what is the split in transport modes?	
Distance travelled within the region	The distances being travelled	How far are people travelling to get to their workplaces during Games time, from their homes or their temporary accommodation?	
National and international travel and accommodation to the Games host city/region	Refer to sections 7.3.2 ("Travel to the host country and to venues (NOCs, spectators, other)") and 7.3.4 ("Accommodation (spectators, NOCs, other)")		

TABLE 27: EXPECTED DATA QUALITY FOR OCOG-RELATED WORKFORCE TRAVEL TO VENUES THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	Initial	Reference	Revised	Actual
OCOG-related workforce travel to venues	Low	Low	Medium	Medium

17 It is likely that multi-mode travel will often be used to complete a journey, and it is very difficult to capture data relating to every element of someone's journey. Therefore, at a minimum, the mode type for a journey should be based on the mode of transport used to travel the greatest distance.

Not included in this category:

- Nights spent in the Olympic Village (building construction and energy consumption are included in "Permanent infrastructure: Non-competition venues" and "Preparations and operations: Energy use"; see sections 7.2 and 7.1.5 respectively).

- Nights reserved by stakeholder groups themselves (e.g. NOCs, spectators, media, athletes staying in accommodation of their own choosing during Games time, etc.) (included in "Associated activities: Accommodation (spectators, NOCs, other)"; see section 7.3.4).

7.1.17.2 Data to be collected
GHG emissions related to accommodation are calculated based on either:

- The number of nights per stakeholder group, per type of accommodation.
  - See section 8.1.10 for a data recording table template.

- Where an accommodation type is exclusive for the Games
  - the utilities consumption (electricity, gas, water) for the period of exclusive use.
  - See sections 8.1.1 and 8.1.3 for data recording table templates.

Expected data quality through carbon footprint iterations can be found below in Table 28. For data quality definitions, see section 4.2.3.

7.1.17.3 Emission factors
Use the default emission factor database for hotels provided in section 8.2. For wider accommodation types, ensure that emission factors are geographically relevant.

7.1.18 Live sites

7.1.18.1 Category description
This category includes the materials and energy consumption related to live sites in Games host cities/regions, and any other events or spectaculars organised and operated by the OCOG and Games host cities/regions. Live site activities included in this category are:

- Overlay and temporary structures: materials and embodied carbon.

- Transport of assets, materials and equipment from suppliers to live site locations.

- Energy consumption.

- Waste generated (optional).
  - If waste management is organised as separate collections, meaning data are available, then include this data. If the waste generated is absorbed into wider city waste management processes, then it is unlikely that specific live site-related data will be available and so this activity can be excluded from this category.

Note: this breakdown of activities is based on the assumption that suppliers involved in the construction and operations of live sites are separate to the contractors across other Games venues and sites. Where these suppliers are the same, it is possible that live site data reporting is included alongside other category data reporting (for example, "Preparations and operations: Energy use" and "Preparations and operations: Overlay and temporary structures"; see sections 7.1.5 and 7.1.3 respectively).

Not included in this category:

- Events organised by Games host cities/regions and/or local communities, where the OCOG is not directly involved in operations (included "Associated activities: City operations"; see section 7.3.6).

7.1.18.2 Data to be collected
GHG emissions are calculated as follows, based on:

- Overlay and temporary structures: materials and embodied carbon – based on the amount (kg/tonnes) per type of material (e.g. giant screens, wood, plastic, metal, etc.) used.
  - See section 8.1.4 for a data recording table template.
    - If full details of all materials are not available, it is reasonable to identify the predominant material that makes up the asset, ideally by weight, and apply this to the calculation.
    - If data are not available for physical flows, it is possible to estimate GHG emissions based on financial flows. In this case, the list of data to be collected is much shorter, but the accuracy of a carbon footprint calculated based on financial flows is generally lower than a carbon footprint calculated with physical flows. See section 8.1.8 for a data recording table template.

TABLE 28: EXPECTED DATA QUALITY FOR ACCOMMODATION THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Accommodation reserved by the OCOG	Low	Low	Medium	Medium to high

- Transport of assets, materials and equipment from suppliers to live site locations – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne.km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
  - See section 8.1.5 for a data recording table template.

- Energy consumption – based on the types and amount of energy used on site.
  - See section 8.1.1 for a data recording table template.

- Waste generated (optional) – if relevant to include, refer to section 7.1.13.

If bio-based materials (e.g. bamboo, cotton fibres, etc) or biofuels are used, apply the methodology described in section 9.3.

Expected data quality through carbon footprint iterations can be found below in Table 29. For data quality definitions, see section 4.2.3.

7.1.18.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

7.2 Permanent infrastructure

7.2.1 Category description
This category includes the materials and energy needed for the construction of permanent infrastructure, and for the refurbishment and upgrade of existing infrastructure required to host the Games. It includes the construction of permanent venues, and all related urban and transport infrastructure specifically required for the Games, that would not otherwise have been built and/or completed in the Games' timeframe.

The infrastructure can be divided into three categories depending on their function:

1. Competition venues

2. Non-competition venues (e.g. Olympic Village, IBC/MPC, training venues, warehouses, etc.)

3. Venue-related urban utilities and transport infrastructure

7.2.2 Permanent infrastructure: Carbon footprint boundary guidance
It is not always black and white whether infrastructure investment should be included within the boundary of the Games' carbon footprint due to the more complex context surrounding some projects. There is a reputational risk of excluding such projects, which have strong association with the Games.

Conversely, there is a risk in some cases that the Games' carbon footprint could become inflated by numerous collateral activities, all of which are "nice to haves" but none of which are strictly necessary. Therefore, it is crucial that all permanent infrastructure projects that may be associated with the Games are recognised and clearly justified for their inclusion or exclusion.

Competition and non-competition venues
Table 30 on the following page provides a summary of the typical types of venue infrastructure projects that may take place, and the recommended approach to including or excluding associated emissions in relation to the Games' carbon footprint.

TABLE 29: EXPECTED DATA QUALITY FOR LIVE SITES THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Overlay and temporary structures: materials and embodied carbon	Low	Low	Low	Medium
Transport of assets, materials and equipment from suppliers to live site locations	Low	Low	Medium	High
Energy consumption	Low	Low	Low to medium	High
Waste generated (optional)	Low	Low	Medium	High

TABLE 30: SUMMARY OF APPROACH TO INCLUDING OR EXCLUDING PERMANENT INFRASTRUCTURE

Type of project	Description of project	Carbon footprint inclusion/exclusion guidance
Temporary		
Temporary	• Shell is temporary • When all Games infrastructure is dismantled, the site is returned to its previous condition	• See "Preparations and operations: Overlay and temporary structures" (section 7.1.3)
Existing (completed and used by the owner, public or local community before the Games)		
With overlay	• Venue already exists • Building shell and footprint remain the same • No major deconstruction/ reconstruction • Venue's current purpose is the same as at Games time	• Construction emissions and embodied carbon emissions are not included • Overlay included in "Preparations and operations: Overlay and temporary structures" (see section 7.1.3)
With permanent upgrades	• Venue already exists • Building shell and footprint remain the same • Major upgrades, including partial deconstruction/reconstruction	• Construction emissions relating to major upgrades and partial deconstruction/reconstruction are included in the Games' carbon footprint • Embodied carbon associated with the upgrades is included • Embodied carbon emissions associated with the existing state of the venue are excluded
New		
Additional	• No existing facilities or facility upgrades before the time of the future host election • Facility was built because of the city/region hosting the Games and will remain after the Games	• All construction emissions associated with the new asset are included in the Games' carbon footprint • All embodied carbon emissions associated with the new asset for the life cycle of the asset are included in the Games' carbon footprint
Planned	• No existing facilities before the time of the future host election, or refurbishments/amendments to existing facilities • Building permit approved, funding scheme secured and legacy plan completed at the time of the future host election • Facility is built in advance of the Games and will remain in use after the Games	• All construction emissions related to the build of this new asset are excluded from the Games' carbon footprint • Embodied carbon emissions after the original build timescale are excluded

Venue-related urban and transport infrastructure
It is sometimes unclear whether public transport, road and utility infrastructure projects are Games-related or sit outside the Games.

The Targeted Dialogue phase of determining a future Games host invites Preferred Hosts to specify the operational plans for Games-time transport. This will usually include a combination of existing transport infrastructure, plus any currently planned infrastructure due to be completed within the timeframe. Any additional transport infrastructure, not previously planned and required as a necessity for Games' operational plans, should be included. There may also be some additional works necessary specifically for the Games, such as accessibility improvements, line upgrades, new stations and utility-related upgrades. If so, they would also need to be included.

Any new public transport infrastructure that was proven to be planned and delivered irrespective of the Games would not be counted, even if it becomes part of revised operational plans. This is because the new infrastructure, while beneficial, is not strictly necessary for operating the Games.

Other types of projects
Municipalities often undertake urban "beautification" initiatives and upgrades to infrastructure and amenities in anticipation of the Games. These will very likely add to the positive impression of the host territory for visitors and create a sense of civic pride for local people. There may also be other types of projects that have been accelerated because of the Games but which are not required for the Games' operational purposes. This is a common situation and may be regarded as the catalytic effect of the Games, whereby public authorities and developers are able to bring forward plans that might otherwise have taken several more years to achieve. If they are not required for the Games' operational purposes, these types of projects and initiatives may be excluded from the Games' carbon footprint.

7.2.2.1 Post-Games transformation of permanent infrastructure
Under new policies, as exemplified by the IOC's "The New Norm", there should be far fewer cases than in previous Games of expensive transformation works to convert venues from Games configurations to legacy mode. The potential impact of these conversion works should have been factored out during the design phase.

There are two situations to consider in this context:

Dismantling activities: These activities consist of the dismantling of some portions of infrastructure that were specific for the Games. It could include, for example, additional seats in a sports venue that are not required in legacy use.

Transformation works: These works are undertaken to accommodate legacy purposes, different from their Games function. They are usually carried out by (or on behalf of) future owners of the venues and are not part of the OCOG's remit. A typical example is the conversion of an Olympic Village into residential units and other amenities.

According to the definition above, the following rules apply:

- The emissions related to dismantling activities should be included in the Games' carbon footprint, in the appropriate category of the sphere of activities "Construction of permanent infrastructure".
- The emissions related to the reconstruction and/or transformation of venues after the Games are excluded from the Games' carbon footprint boundary.

7.2.3 Data to be collected
As a first approach, the emissions of each construction project determined to be within the carbon footprint boundary must be calculated based on the total quantity and type of materials and energy consumption for the construction and refurbishment of all infrastructure. The best way to do this is by requesting a life cycle assessment (LCA) as part of the design and planning of the project.

If an LCA is not possible, then an understanding of materials and energy sources used in the construction project would be useful. The data recording format shown below in Table 31 provides a guide on the types of data that should be sought.

If these data are not available, estimate GHG emissions by first dividing permanent infrastructure into six main types:

- Outdoor stadia
- Indoor venues
- Outdoor venues
- Building construction
- Landscaping (around the infrastructures)
- Venue-related urban and transport infrastructure

For each of these infrastructure categories, calculate GHG emissions based on an average emission factor as follows:

- Outdoor stadia
  This category refers to open stadiums (i.e. without enclosing roofs), such as for athletics, equestrian and hockey. GHG emissions of an outdoor stadium can be calculated based on its seating capacity. An average factor for GHG emissions per spectator must be calculated for the construction of outdoor stadia based on the amount of materials and energy of one or more similar venues in the country, using the data collection template from Table 31.

- Indoor venues
  This category refers to indoor, arena-style venues, typically used for combat sports, track cycling and basketball. As with outdoor stadia, GHG emissions of each indoor venue can be calculated based on its capacity. An average factor for GHG emissions per spectator must be calculated for the construction of indoor venues based on the number of materials and energy of one or more similar venues in the country.

- Outdoor venues
  This category refers to venues such as golf courses and rowing lakes, which have relatively little building construction and typically involve earthworks and various amounts of landscaping. GHG emissions of each competition area can be calculated based on the total transformed surface area and an average emission factor per square metre.

TABLE 31: DATA RECORDING TEMPLATE FOR PERMANENT INFRASTRUCTURE CONSTRUCTION OR REFURBISHMENT

Material/source of energy	Unit	Amount	Source	Comment
Material				
Concrete	m^3		OCOG FAs: Venue Development, Venue Urban Infrastructure, Villages; Games host city/region	
Steel	tonnes			
Stainless steel	tonnes			
Aluminium	tonnes			
Mortar	tonnes			
Asphalt	tonnes			
Wood (planted)	tonnes			
Wood (native)	tonnes			
Plaster	tonnes			
Paintings	tonnes			
Plastics	tonnes			
Sealant membranes	tonnes			
Stone	tonnes			
Ceramics	tonnes			
Earth moved	m^3			
...	...			
Energy consumption and/or machinery fuel consumption				
Fuels (e.g. diesel, biodiesel, etc.)	litres		OCOG FAs: Venue Development; construction delivery partner(s)	The energy consumption of machinery can be calculated based on hours of use of machinery
Electricity from the grid	kWh			
...				

- Building construction
  This category refers to non-competition buildings such as the IBC/MPC, Olympic Villages and transport or storage depots. GHG emissions of each building construction can be calculated based on the surface of the constructed area and an average emission factor, which can be calculated as the average of the emission factors of the different types of buildings.

- Landscaping
  GHG emissions of landscaped areas can be calculated based on their total surface area and an average emission factor for landscaping per square metre.

- Venue-related urban and transport infrastructure
  GHG emissions must be calculated as follows. For the construction of urban roads, GHG emissions are calculated based on the total surface area of roads and an average emission factor per square metre of road. For the construction and refurbishment of other types of infrastructure, GHG emissions can be calculated based on total surface area of the structure and an average emission factor per square metre.

If using this alternative methodology of calculation, use Table 32 as a data collection template.

TABLE 32: DATA RECORDING TEMPLATE FOR PERMANENT INFRASTRUCTURE

Type of venue	Category (competition venues, non-competition venues, etc.)	Venue name	Construction type (new, refurbished)	Constructed area	Spectator capacity	Competition area (fields of practice)	Landscaped areas	Venue-related and transport infra-structure	Source
	[-]	[-]	[-]	[m^2]	[unit]	[m^2]	[m^2]	[m^2]	
Outdoor stadium			New						OCOG FAs: Venue Development, Construction Delivery Partner(s)
Outdoor stadium			Refurbished						
...									
Indoor venue			Refurbished						
...									
...									

7.2.4 Emission factors

If an LCA is conducted, then life cycle emission factors should be used as a priority, excluding the "in-use" emissions and a proportional measure of end-of-life emissions based on the proposed occupancy by the Games and the life expectancy of the structure. If the second referenced approach is applied (using the amount and type of material and energy used for the constructions and refurbishments), apply country-specific emission factors and/or emission factors specific to the database selected for this category.

If the second estimation approach is applied (using average emission factors for each type of permanent infrastructure), the average emission factor should be calculated using examples from venue(s) within the host country, and based on country-specific emission factors and/or emission factors specific to the database selected.

If GHG emissions are calculated based on financial flows, a number of databases are available with geographically relevant emission factors. They include (but are not limited to) the following:

- Greenhouse gas footprint indicators (OECD)
- Ecoinvent Database

Please also refer to section 9.4, which explains how to take account of inflation and currency conversion rates so that emission factors are applied accurately in present-day values.

7.3 Associated activities

This category includes activities that are clearly due to the Games taking place but are not part of construction or organisational activities. For example, they would include accommodation for spectators during the Games but not their accommodation for other purposes, such as pre- or post-Games tourism. There are many other activities that might also be included, but the practical difficulties in obtaining meaningful data will generally place them outside the Games' carbon footprint boundary.

7.3.1 Uniforms (other)

7.3.1.1 Category description
This category includes all uniforms not included in "Preparations and operations: Uniforms" (see section 7.1.8). In other words, it includes all uniforms that are associated with the Games but for which the OCOG does not have operational oversight.

This includes, in particular, the uniforms of NOCs, sponsor staff, IFs, technical delegates, contractors, officials and wider security services, as well as others.

Not included in this category:

- Uniforms related to contractors captured within "Preparations and operations" are included in "Preparations and operations: Uniforms" (see section 7.1.8), as well as other relevant "Preparations and operations" categories. In particular, this covers uniforms relating to:
  - Workforce (OCOG staff, volunteers, Games delivery partners where OCOG has visibility)
  - Overlay and temporary structures (see also section 7.1.3)
  - Catering (see also section 7.1.10)
  - Torch relays (see also section 7.1.13)
  - Cleaning and waste services
  - OCOG-coordinated security (see also section 7.1.14)

7.3.1.2 Data to be collected
To facilitate data collection, requirements to collect data related to uniforms should be included within supplier contracts.

To facilitate data collection from NOCs, an estimation provided by two or three large and representative NOCs can be extrapolated to other NOCs.

GHG emissions for associated uniforms are calculated as follows:

- Materials and embodied carbon associated with uniform manufacture funded by the OCOG – based on type of textile, weight of item and total number of uniforms.
  - See section 8.1.4 for a data recording table template.

- Transport of uniforms from suppliers to OCOG warehouses and venues – based on either:
  - the weight of material transported, per mode of transport, multiplied by the total distance travelled (expressed in tonne. km); or
  - the amount of fuel (litres) and/or electricity (kWh) used for freight where individual vehicles (fully or partly laden) are delivering purely to the OCOG and are not part of mixed consignments for different customers.
    - See section 8.1.5 for a data recording table template.

Where there are no physical flows of data available, or where it is prohibitively resource-intensive to locate and estimate physical flows of data, it is possible to estimate GHG emissions based on financial flows. See section 8.1.8 for a data recording table template.

If natural fibres (e.g. bamboo, cotton fibres, etc.) are used, apply the methodology described in section 9.3.

Expected data quality through carbon footprint iterations can be found below in Table 33. For data quality definitions, see section 4.2.3.

TABLE 33: EXPECTED DATA QUALITY FOR UNIFORMS (OTHER) THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
Uniforms (other)	Low	Low	Low	Medium

7.3.1.3 Emission factors
Use emission factors specific to the database selected for this category.

7.3.2 Travel to the host country and to venues (NOCs, spectators, other)

7.3.2.1 Category description
This category includes all transport not organised by the OCOG – in other words, all travel not covered within the "Preparations and operations" categories. It includes Games-time travel, as well as key pre-Games stakeholder meetings such as Chefs de Mission Seminars and World Press Briefings.

Key groups of stakeholders in this category include:

- NOC delegations (including athletes, support teams, etc.) – travel to/from the Games host city/region (local travel within the Games host city/region is expected to be included in "Preparations and operations: OCOG-provided ground transport"; see section 7.1.15).
  - Accredited delegates – all accredited media should be included.
  - Non-accredited NOC delegates – to be reviewed on a case-by-case basis.

- Media – travel to/from the Games host city/region (where local transport is not provided or funded by the OCOG).
  - Accredited media – all accredited media should be included.
  - Non-accredited media – to be reviewed on a case-by-case basis.
  - Third-party broadcast and media companies.

- Volunteers – travel to/from the Games host city/region (local travel within the Games host city/region is included in "Preparations and operations: OCOG-related workforce travel to venues"; see section 7.1.16).

- Spectators[18] – travel to/from the Games host city/region and local travel within the Games host city/region.
  - Ticketed spectators – all ticketed spectators should be included.
  - Non-ticketed spectators – to be reviewed on a case-by-case basis (see below).

Not included in this category:

- OCOG business travel (included in "Preparations and operations: OCOG headquarters"; see section 7.1.1).

- OCOG-provided transport such as fleet and shuttle buses (included in "Preparations and operations: OCOG-provided ground transport"; see section 7.1.15).

- Travel related to Games workforce (OCOG staff, volunteers, contractors) during Games time (included in "Preparations and operations: OCOG-related workforce travel to venues"; see section 7.1.16).

- Travel related to staff and contractors of some key operational suppliers (included in various "Preparations and operations" categories).

- Travel to/from the torch relay route(s) (included in "Preparations and operations: Torch relays" and "Associated activities: Transport to torch relays (spectators, other)"; see sections 7.1.12 and 7.3.3 respectively).

7.3.2.2 Data to be collected
For international and national travel to and from the Games host city/region and venues, GHG emissions are calculated based on the number of persons per point of origin and per mode of transport multiplied by the distance they travelled – hence person * km, denoted p.km or person.km.

The three parameters that must be taken into account are:

1. The number of people per point of origin coming to the Games host city/region for Games-specific reasons.

2. Modes of transport (including occupancy rates for car travel and class of travel for flights).

3. Distance travelled from points of origin to the Games host city/region/venue (to also inform a return trip).

When approaching the calculation, it may make sense to break down the journeys of these stakeholders into two parts. This is due to how the context, and therefore the assumptions that would be required, differ when considering travel at a national or international scale compared to a local or city scale. The aforementioned three parameters still remain relevant to both:

- Part 1 – Travel from the point of origin to the Games host city/region, and return.

- Part 2 – Travel within the Games host city/region to venues and other Games activities.

7.3.2.2.1 Use of assumptions
It will be very difficult to gain and track accurate data for these stakeholder groups, and therefore there will be a reliance on assumptions.

A list of likely assumptions is outlined in Table 34 on the following page. Consequently, it is important that careful thought is given to ways in which context and insight can be gathered to inform the assumptions used. It is likely that within each stakeholder group, there will also be segmentation (e.g. based on where people are travelling from), with different assumptions being applied to different sub-groups. There are no prescriptive rules on the assumptions to apply, as this is often context-specific. Any assumptions that are made should be substantiated.

18 The stakeholder group that refers to all persons who have a ticket to any session of the Olympic Games or those who attend non-ticketed events. They may be local (within the Games host city/region), national (within the Games host country and outside the Games host city/region) or international (originating from outside the Games host country). Ticketed spectators have either purchased their tickets from an official source (e.g. the OCOG, an Authorised Ticket Reseller (ATR), etc.) or have been invited as guests (e.g. as marketing partners' hospitality guests).

TABLE 34: SUMMARY OF APPROACH TO CALCULATE EMISSIONS ASSOCIATED WITH OCOG TRAVEL

Parameter	What you need to know	The question you're trying to answer	Sources of insight to inform assumptions
Number of people/ journeys	The total number of journeys being undertaken	How many people, per stakeholder group, are going to be travelling to the Games?	• OCOG FA: Workforce • OCOG FAs: Press Operations, Broadcast • OCOG FA: Ticketing • Post-event surveys
	The number of tickets per "journey" (relevant mainly for spectators)	People may buy multiple tickets, meaning the ratio of long-distance journey to ticket is not 1:1. Therefore, how many unique journeys might be undertaken?	• OCOG FA: Ticketing (number of tickets per unique purchaser, local vs regional vs international) • Post-event surveys
Mode of transport	Mode of transport used[19]	What types of transport are people using to get to their destination?	• Questions during ticket-purchase process • OCOG FA: Ticketing • OCOG/Games delivery partner: Transport demand modelling • Post-event surveys
	The split of international vs regional vs local	How does the transport mode differ depending on the type of journey being taken?	
Distance travelled	The distances being travelled	How far are people travelling to attend the Games?	• OCOG FA: Ticketing (geographic breakdown of ticket purchasers) • Post-event surveys
Accommodation	See section 7.3.4 ("Associated activities: Accommodation (spectators, NOCs, other)"		

19 It is likely that multi-mode travel will often be used to complete a journey, and it is very difficult to capture data relating to every element of someone's journey. Therefore, at a minimum, the mode type for a journey should be based on the mode of transport used to travel the greatest distance.

More specific guidance on data to be collected across each parameter and the types of likely assumptions required per stakeholder group are given below:

7.3.2.3 NOCs, media, broadcast, volunteers

The likely sources of data and types of assumptions are outlined across each stakeholder group below in Table 35.

TABLE 35: SUMMARY OF APPROACH TO CALCULATE EMISSIONS ASSOCIATED WITH NOC, BROADCAST, MEDIA AND VOLUNTEERS

Journey breakdown	1. The number of people per point of origin coming to the Games host city/region for Games-specific reasons	2. Modes of transport (including occupancy rates for car travel and class of travel for flights)	3. Distance travelled from points of origin to the Games host city/region/venue (to also inform a return trip)
NOCs: Chefs de Mission Seminar and Games-time travel			
Part 1 – To Games host city/region	Use the delegation lists provided by NOCs and approved by the OCOG, which specify the number of people in each official NOC delegation travelling to the Games.	Determine the most reasonable mode of transport based on points of origin and distance travelled. In the absence of better information, for countries likely to fly with long-haul journeys (over six hours), assume "premium economy" class; and for those with medium- to short-haul journeys' (under six hours), assume "economy" class.	Assume points of origins are in the NOC's country, unless more detailed information is available. In the absence of better information, assume all personnel are travelling from the capital city of the country with which they are associated.
Part 2 – Within Games host city/region	The majority are expected to travel by shuttle buses and OCOG-provided transport, included in "Preparations and operations: OCOG-provided ground transport" (see section 7.1.15).		
Media: World Press Briefings and Games-time travel			
Part 1 – To Games host city/region	The number of accredited media approved by the OCOG per country. One accreditation is equal to one media representative.	Determine the most reasonable mode of transport based on points of origin and distance travelled. In the absence of better information, for those flying, assume an average class of travel.	Using media personnel's country of origin, determine the return distance to/from the Games host city/region per origin region/country. In the absence of better information, assume all personnel are travelling from the capital city of the country with which they are associated.
Part 2 – Within Games host city/region	It is expected that media personnel would have access to and use OCOG-provided ground transport (e.g. shuttle buses), included in "Preparations and operations: OCOG-provided ground transport" (see section 7.1.15). If media personnel are also expected to travel in significant numbers on other modes of transport (not just OCOG-provided ground transport), this should be accounted for separately in this category, using similar guidance on assumptions as detailed in "Preparations and operations: OCOG-related workforce travel to venues" (see section 7.1.16).		
Volunteers:			
Part 1 – To Games host city/region	The number of volunteers per region (if volunteers are from the host country) or country (if volunteers originate outside the host country).	Determine the most reasonable mode of transport based on points of origin and distance travelled. In the absence of better information, for those flying, assume an average class of travel.	Using points of origin, determine the return distance to/from the Games host city/region per region and country from which volunteers are travelling.
Part 2 – Within Games host city/region	Included in "Preparations and operations: OCOG-related workforce travel to venues" (see section 7.1.16).		

7.3.2.4 Spectators

Olympic spectators can be divided into two broad sub-categories:

- Ticketed spectators (included) – those with officially issued tickets to attend events.
  - This category of spectators should be included within the carbon footprint boundary, as metrics relating to ticket holders, which can be used to inform calculation assumptions, are accessible.

- Non-ticketed spectators (optional) – those who visit the Games host city/region or attend non-ticketed events (e.g. to visit live sites, watch road races, etc.).
  - Metrics associated with non-ticketed spectators are much harder to access. It is therefore much more difficult to determine both the numbers of non-ticketed spectators and robust information associated with them that could be used to inform calculation assumptions. Potential sources of information to inform metrics may be available via economic impact survey metrics and/or capacity expectations for non-ticketed events (e.g. live sites, road races, etc.).

The high-level approach to gaining information to calculate emissions associated with ticketed spectators is set out below in Table 36. The same principles of approach for ticketed spectators can also be used for non-ticketed spectators. The main difference, however, is the fewer sources of reliable information from which to inform the assumptions used.

ASSUMPTIONS FOR SPECTATORS' TRAVEL

It is reasonable to assume that spectators travelling long distances to the Games are likely on average to have more tickets per person than people living in the Games host city/region/country. Overall, though, the vast majority of tickets are likely to be sold to people within the Games host country. One possible permutation is shown below in Table 37 on the following page.

Real data on the origins of ticketed spectators and their selected mode(s) of transport may be obtained from ticketing sales data and ticket-holder surveys (pre-Games and post-Games). However, this information will only become available later in the Games life cycle, so this aspect of the Games' carbon footprint will be heavily based on assumptions.

TABLE 36: SUMMARY OF APPROACH TO CALCULATE EMISSIONS ASSOCIATED WITH SPECTATOR TRAVEL

Journey breakdown	1. The number of people per point of origin coming to the Games host city/region for Games-specific reasons	2. Modes of transport (including occupancy rates for car travel and class of travel for flights)	3. Distance travelled from points of origin to the Games host city/region/venue destination (to also inform a return trip)
Ticketed spectators			
Part 1 – To Games host city/region	Use ticket data, which specifies the number of tickets sold and how many people have bought tickets, and/or the number of unique purchasers.	Determine the most reasonable mode of transport based on points of origin and distance travelled. This could be further substantiated through the use of survey data and transport demand modelling.	Assume the country of ticket purchase is the country from which each ticket-holder will be travelling. In the absence of better information, assume all international spectators are travelling from the capital cities of their home countries. This could be substantiated through survey data. Ensure distance factors in a return trip.
Part 2 – Within Games host city/region	Use ticket data and venue capacity information to understand how many people are travelling to each venue over the Games period.	Determine the most reasonable mode of transport split based on points of origin and distance travelled. This could be further substantiated through the use of survey data and transport demand modelling.	This could be estimated based on average distances from the city centre to each venue, and substantiated through survey data. Ensure distance factors in a return trip.

TABLE 37: AVERAGE NUMBER OF EVENTS PER SPECTATOR

Place of origin	Average number of events per spectator	Estimated percentage of total Games tickets
Games host city	2	50%
Games host region (e.g. province, state, etc)	3	25%
National (including near-neighbour countries)	4	15%
International (long-haul)	5	10%

Note: if aggregated, the above assumptions translate to an overall average of approximately 2.5 tickets per spectator, based on a total ticket allocation of 10 million tickets.

Expected data quality through carbon footprint iterations can be found below in Table 38. For data quality definitions, see section 4.2.3.

7.3.2.5 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category. The emission factor used for the consumption of fuel or mode of transport must account for the production and the combustion of those fuels.

For plane travel, radiative forcing should be included in the emission factor selected if available, as it accounts for the full impact of burning fuels at a high altitude.

7.3.3 Travel to torch relays (spectators, other)

7.3.3.1 Category description
This category includes transport to and from the torch relay route(s) that is not funded by the OCOG and primarily concerns spectators, but possibly also includes other stakeholders such as media and broadcast personnel. The transport of staff and torchbearers is separately included in "Preparations and operations: Torch relays" (see section 7.1.12).

7.3.3.2 Data to be collected
GHG emissions are calculated based on number of persons per point of origin and per mode of transport multiplied by the distance they travelled, hence person * km, denoted p.km or person.km. The three parameters that must be taken into account are thus:

1. Number of people per point of origin (mainly local spectators)
2. Mode of transport (including occupancy rates for car travel)
3. Distance travelled from home to torch relay route(s) (also to inform a return trip)

These elements are usually very difficult to measure or to estimate, as torch relays are non-ticketed events. However, estimation can be made based on surveys or on attendance estimation by local authorities.

Tables 39 and 40 on the following page provide an overview of the types of data to consider for this category.

TABLE 38: EXPECTED DATA QUALITY FOR TRAVEL TO HOST COUNTRY (SPECTATORS, OTHER) THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	Initial	Reference	Revised	Actual
Travel to host country (spectators, other)	Low	Low	Low	Medium

TABLE 39: DATA COLLECTION TEMPLATE FOR TRANSPORT TO AND FROM TORCH RELAYS (NUMBER OF SPECTATORS AND POINTS OF ORIGIN)

Origin	Proportional split between origins	Number of spectators	Source
[-]	[%]	[spectators]	
Local	e.g. 50%		OCOG FA: Torch Relays
Neighbouring towns	e.g. 20%		
...			
Total	**100%**		

TABLE 40: DATA RECORDING TEMPLATE FOR TRANSPORT TO AND FROM THE GAMES (MODE AND DISTANCE OF TRANSPORT PER POINT OF ORIGIN)

Mode of transport	Modal split	Distance travelled (one way)	Source	Comment
[-]	[%]	[km]		
Metro			OCOG FAs: Transport, Ticketing; surveys, national statistics on transport for leisure activities	
Bus				
...				
Passenger car (occupancy rate: x person/car)				Complete the occupancy rate of passenger cars
Bicycle				
On foot				
...				
Total locals	**100%**			
Train			OCOG FAs: Transport; surveys, national statistics on transport for leisure activities in Games host city/region	
Coach				
...				
Total neighbouring towns	**100%**			

Expected data quality through carbon footprint iterations can be found below in Table 41. For data quality definitions, see section 4.2.3.

7.3.3.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

7.3.4 Accommodation (spectators, NOCs, other)

7.3.4.1 Category description
This category includes all accommodation not financed or organised by the OCOG. In other words, it includes all accommodation not covered so far by the "Preparations and operations" categories. It includes Games-time accommodation, as well as key stakeholder pre-Games meetings such as Chefs de Mission seminars and World Press Briefings.

This category therefore includes (but is not limited to) the stakeholders listed below staying in hotels or other types of accommodation that are neither official hotels nor Olympic/Paralympic Villages, or in other accommodation not funded by the OCOG.

- NOC delegations – NOC personnel that are not eligible for official accommodation.
- Media – media personnel that are not eligible for official accommodation.
- Broadcast – broadcast personnel that are not eligible for official accommodation.
- Volunteers – accommodation organised by volunteers themselves for the purpose of volunteering at the Games.
- Spectators – accommodation organised by spectators to attend the Games:
  - Ticketed-spectators – all ticketed spectators should be included.
  - Non-ticketed spectators – to be reviewed on a case-by-case basis (as per section 7.2.6).

Not included in this category:

- OCOG business travel accommodation (included in "Preparations and operations: OCOG headquarters"; see section 7.1.1).
- OCOG-provided accommodation (included in "Preparations and operations: Accommodation"; see section 7.1.17).
- Accommodation related to staff and contractors from some key operational suppliers (included in various "Preparations and operations" categories).
- Accommodation related to the core torch relay team (included in "Preparations and operations: Torch relays"; see section 7.1.12).

As a reminder, accommodation and related food and beverage (F&B) for other purposes – for example, pre- and/or post-Games tourism – are not included in these calculations and are considered out of the scope of the Games' carbon footprint.

7.3.4.2 Data to be collected
GHG emissions related to accommodation are calculated based on the number of nights per type of accommodation.
- See section 8.1.10 for a data recording table template.

It will be difficult to gain and track accurate data for some stakeholders, and there will therefore be a reliance on assumptions. It is important to find ways to gather insights to inform the assumptions used. For example, it could be helpful to integrate a question into existing stakeholder communications or surveys, asking members of that stakeholder group how many nights they plan to stay (pre-event) or have stayed (post-event) in commercial accommodation to attend the Games. Assuming a good sample size, responses to this question could be combined with other characteristics, such as how far they have travelled to attend the Games, to substantiate the assumptions used.

Expected data quality through carbon footprint iterations can be found below in Table 42. For data quality definitions, see section 4.2.3.

TABLE 41: EXPECTED DATA QUALITY FOR TRAVEL TO TORCH RELAYS (SPECTATORS, OTHER) THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	Initial	Reference	Revised	Actual
Travel to host country (spectators, other)	Low	Low	Low	Medium

TABLE 42: EXPECTED DATA QUALITY FOR ACCOMMODATION (SPECTATORS, OTHER) THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	Initial	Reference	Revised	Actual
Accommodation (spectators, other)	Low	Low	Low to medium	Medium

7.3.4.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category. See section 7.2.9.3.

There are no additional carbon emissions associated with overnight stays at the homes of friends or family, so therefore use the emission factor 0kgCO_2e/night for those stays.

Databases commonly include "hotel" emission factors. This may not reflect a room night where other types of accommodation are used, such as flats/apartments, B&Bs and motels. Where accommodation is not a hotel, it may be more appropriate to use the lowest level of accommodation available in the Hotel Footprinting Tool, produced by the International Tourism Partnership and Greenview. The tool has been derived from the Cornell Hotel Sustainability Benchmarking Index, which uses annual data from international hotel companies and a standardised industry methodology.

7.3.5 NOC/NPC houses, IF and commercial partner pavilions

7.3.5.1 Category description
This category includes all activities related to houses and pavilions that are active during the Games, such as:

- Materials and embodied carbon involved in construction, fit-out and decoration.
- Transport of materials, assets and equipment utilised in the spaces.
- Energy consumption.
- Food and beverage (F&B), and giveaways.
- Waste production and disposal, including for dismantled material of temporary structures.

7.3.5.2 Data to be collected
GHG emissions are calculated based on:

- The amount per type of material (e.g. wood, plastic, metal, etc.). See "Preparations and operations".
  - See section 8.1.4 for a data recording table template, cross-referencing with "Preparations and operations: Overlay and temporary structures" (see section 7.1.3).
- Freighting of materials and goods, based on the distance travelled and the transport mode.
  - See section 8.1.5 for a data recording table template.
- The type and amount of energy used on site.
  - See section 8.1.1 for a data recording table template.
- The type and amount of food served.
  - See section 8.1.4 for a data recording table template, cross-referencing with "Preparations and operations: Catering" (see section 7.1.10).
- The type and amount of giveaways given during Games time.
  - See section 8.1.4 for a data recording table template, cross-referencing with "Preparations and operations: Merchandise (see section 7.1.9).
- Waste production and disposal, including for dismantled material of temporary structures – based on the total amount of waste generated per waste stream through site build and breakdown.
  - See section 8.1.2 for a data recording table template.

If bio-based materials (e.g. wood) or biofuels are used, apply the methodology described in section 9.3.

If data are not available for physical flows, it may be possible to estimate GHG emissions based on financial flows. In this case, the list of data to be collected is much shorter, but the accuracy of a carbon footprint calculated based on financial flows is generally lower than a carbon footprint calculated with physical flows. The main challenge will be to obtain budget and actual cost information from the various organisations commissioning these structures. The OCOG will not normally have access to these data.

- See section 8.1.8 for a data recording table template.

Expected data quality through carbon footprint iterations can be found below in Table 43. For data quality definitions, see section 4.2.3.

TABLE 43: EXPECTED DATA QUALITY FOR NOC/NPC HOUSES AND IF AND COMMERCIAL PARTNER PAVILIONS THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	Initial	Reference	Revised	Actual
NOC/NPC houses, IF and commercial partner pavilions	Low	Low	Low	Low to medium

7.3.5.3 Emission factors
If GHG emissions are calculated based on financial flows, a number of databases are available with geographically relevant emission factors. They include (but are not limited to) the following:

- Greenhouse gas footprint indicators (OECD)
- Ecoinvent Database

Please also refer to section 9.4, which explains how to consider inflation and currency conversion rates so that emission factors are applied accurately in present-day values.

7.3.6 City/region operations

7.3.6.1 Category description
This category includes the materials and energy consumption related to activities organised by Games host cities/regions. These activities may include:

- City/region live sites
- City/region branding and dress
- City/region security operations (for example, enhanced police and military support):
  - Travel to Games host city/region (include)
  - Other associated security activities (optional, depending on data availability)

Not included in this category:

- Activities and events organised by the OCOG (included in "Preparations and operations: Live sites", "Preparations and operations: Look of the Games" and "Preparations and operations: OCOG-coordinated security"; see sections 7.1.18, 7.1.4 and 7.1.14 respectively).
- Transport activities that the Games host city/region would support on, in collaboration with the OCOG (included in "Preparations and operations: OCOG-related workforce travel to venues" and "Associated activities: Travel to the host country and to venues (NOCs, spectators, other)"; see sections 7.1.16 and 7.3.2 respectively).

7.3.6.2 Data to be collected
GHG emissions are calculated based on:

- City/region live sites – apply the same methodology as outlined in 7.1.18.1.
- City/region branding and dress – apply the same methodology as outlined in 7.1.4.
- City/region security operations (for example, enhanced police and military support).
  - Travel associated to the Games host city/region, as well as any Games project-specific accommodation provided to these groups, is based on the number of personnel travelling per country and typical length of stay. It is expected that assumptions will be required due to the potentially tricky and sensitive nature of getting specific data on security travel operations.
    - See section 8.1.6 for a data recording table template.
  - Other associated activities included in security operations – see relevant data recording tables in chapter 8.

If bio-based materials (e.g. bamboo, cotton fibres, etc.) or biofuels are used, apply the methodology described in section 9.3.

Expected data quality through carbon footprint iterations can be found below in Table 44. For data quality definitions, see section 4.2.3.

7.3.6.3 Emission factors
Use country-specific emission factors and/or emission factors specific to the database selected for this category.

TABLE 44: EXPECTED DATA QUALITY FOR CITY OPERATIONS THROUGH CARBON FOOTPRINT ITERATIONS

	Data quality			
Activity	**Initial**	**Reference**	**Revised**	**Actual**
City/region live sites	Low	Low	Low	Low to medium
City/region branding and dress	Low	Low	Low	Medium
City/region city operations	Low	Low	Low	Low to medium

8 DATA TO BE COLLECTED AND EMISSION FACTORS

8.1 Default data to be collected

This section presents further guidance on data to be collected across common activity sub-categories. While the tables aim to provide an overview of the key elements of data to consider and a start point for collecting this data, the data need not be collected in the table formats shown below. It is recommended to work with the data owners to collect data in the best and most efficient way, which makes sense for each context.

The sub-categories covered below include:

- Energy and fuel consumption
- Waste generation
- Water consumption
- Materials and embodied carbon
- Transport of assets, materials and equipment
- Staff and contractor travel and accommodation associated with the Games project
- Employee commuting and homeworking
- Financial flows of data
- Catering
- Business travel and accommodation

8.1.1 Energy and fuel consumption

Table 45 below outlines data to be collected relating to activities where mains and temporary power energy consumption is relevant.

8.1.2 Electricity consumption at warehouse

Table 46 on the following page provides default data for warehouse storage.

8.1.3 Waste generation

Table 47 on the following page outlines data to be collected relating to activities where waste generation is relevant.

8.1.4 Water consumption

Table 48 on the following page outlines data to be collected relating to activities where water consumption is relevant.

TABLE 45: DATA RECORDING TEMPLATE FOR ENERGY USE AT ALL GAMES VENUES

Parameter	Unit	Period of time	Amount	Source	Comment
Floor area of asset (e.g. office, venue, etc.)	m^2			OCOG FAs: HQ Administration, Facilities Management; Games delivery partners	Floor areas can be used to estimate consumption in the absence of higher-quality data
Electricity from the grid	kWh	[years and/or months]		FA owner of energy supply, supplier owner of energy supply	If unknown, can be estimated based on average consumption per m^2 from similar average asset type
Natural gas (heating)	MJ or m^3	[years and/or months]			
Generator: Conventional diesel	litres	[months and/ or days]			
Generator: Biodiesel	litres	[months and/ or days]			
Other energy source	[relevant unit]	[as relevant]			
...					

TABLE 46: DEFAULT DATA FOR WAREHOUSE STORAGE

Parameter	Source
Electricity consumption at warehouse	Real Estate Environmental Benchmarks (REEB) – based on annual utility consumption data of commercial property portfolios within the Better Buildings Partnerships (BBP), including benchmarks for the UK, the USA, Europe and Australia

TABLE 47: DATA RECORDING TEMPLATE FOR WASTE MANAGEMENT

Type of material	Total weight	Waste treatment: Recycling	Waste treatment: Incineration	Waste treatment: Landfilling	Source
[-]	[kg]	[%]	[%]	[%]	
Municipal waste					OCOG FAs: Sustainability, Cleaning and Waste; primary data provided by the Games host city/region
Paper and board					
Wood					
Plastic					
Hazardous waste					
Construction waste					
...					

TABLE 48: DATA RECORDING TEMPLATE FOR WATER MANAGEMENT

Parameter	Unit	Amount	Reporting period	Source	Comment
Water consumption (supply and treatment)	Litres/m^3			OCOG FAs: HQ Administration, Facilities Management; Games delivery partners	Can be estimated based on average consumption per m^2 from similar average asset type
...					

8.1.5 Materials and embodied carbon

Table 49 on the following pages outlines data to be collected relating to materials and embodied carbon.

TABLE 49: DATA COLLECTION TEMPLATE FOR THE PROVISION OF ASSETS, MATERIALS AND EQUIPMENT

Type of item	Unit	Amount	Type of material	Bought new, or rented	Source	Comment
Office goods and services consumption (all goods and services procured by the OCOG to deliver the Games and not captured by other specific categories within this guidance)						
Paper (virgin)	kg/year					
Paper (recycled)	kg/year					
...						
Food	kg/year					
Coffee and tea	kg/year					
All goods not otherwise captured in other categories	Variable – USD spent				OCOG FA: Finance	Activity-specific or supplier-specific data can be used if and where available (e.g. as above), otherwise spend data will be the most likely data source for this wider supply chain activity
All services not otherwise captured in other categories	Variable – USD spent				OCOG FA: Finance	
...						
Overlay and temporary structures						
Carpets	kg		e.g. virgin polypropylene (PP)	New	OCOG FAs: Venue Development, Procurement, Logistics, Villages	Weight of carpets can be estimated based on surface and average density (e.g. 380g/m^2)
Wood	kg		Type of wood	New		
Metals	kg		Type of metal	Rented		
Plastics	kg		Type of plastic	New		
Cabling	kg			New		
Temporary tent structure	kg		Steel	Rented		Weight of steel for tent structures can be estimated based on weight of steel per m^2 of temporary tent
Temporary tent covers	kg		PVC	Rented		Weight of covers (PVC) for all tent structures can be estimated based on weight of cover per m^2 of temporary tent
...						

Type of item	Unit	Amount	Type of material	Bought new, or rented	Source	Comment
Look materials for venues and event promotion (city/region, public transport)						
Printed materials: Fabrics	kg		e.g. polyester		OCOG FAs: Venue Development, Look of the Games	Weight of fabrics can be estimated based on surface and average density (e.g. 250g/m²)
Printed materials: Polypropylene	kg		e.g. virgin PP			Weight of polypropylene can be estimated based on surface of polypropylene panels and average density of polypropylene
LED screens/ perimeter boards	kg					
...						
Electronic equipment and IT services						
Smartphones	Weight (kg)	Number of items			OCOG FA: Telecoms	Equipment manufacturers may produce product LCAs that relate directly to the product or provide an adequate proxy
Switches						
Routers						
...						
Laptops	Weight per item (kg)	Number of items			OCOG FA: Technology Systems	Equipment manufacturers may produce product LCAs that relate directly to the product or provide an adequate proxy
Notebooks and tablets						
Reprography						
Servers						
...						
Barcode readers	Weight per item (kg)	Number of items			OCOG FA: Venue Technology Services	
Audio boards						
Video boards						
TVs						
Webcams						
Other (e.g. projectors, redios, etc.)						
...						

Type of item	Unit	Amount	Type of material	Bought new, or rented	Source	Comment
Uniforms						
Pieces of uniform made from natural textiles (e.g. cotton, ..., etc.)structure	Weight per item (kg)	Number of items	Cotton	New	OCOG FAs: Uniforms; IOC, NOCs, etc.	Clothing manufacturers may produce product LCAs that relate directly to the product; if unavailable, industry-average LCAs may be a reasonable alternative
Pieces of uniform made from synthetic textiles (e.g. polyester, ..., etc.)			Polyester	New		
Pieces of uniform made from unknown type of fibre				New		
...						
Merchandise						
Plush toys	Weight per item (kg)	Number of items	Polyester	New	OCOG FAs: Licensing	Suppliers should be asked for this data as a priority; if they cannot provide the data, it is possible to audit items in retail stores to better understand materials and weights of items
Towels			Cotton	New		
Apparel and sportswear			Polyester cotton	New		
Bags and backpacks			Polyester	New		
Mugs, ceramics and cups			Ceramic	New		
Pins			Metal (steel)	New		
...						
Catering						
Red meat-based meal	-	Number of items		-	OCOG FAs: Catering	
White meat-based meal	-			-		
Fish-based meal	-			-		
Vegetarian-based meal	-			-		
F&B packaging	Weight per item (g)	Number of items	Plastic	-		
...						

Type of item	Unit	Amount	Type of material	Bought new, or rented	Source	Comment
Ceremonies						
Gold medals	Weight per item (g)	Number of items	Silver + x g gold	New	OCOG FA: Ceromonies	
Silver medals			100% silver	New		
Bronze medals			100% bronze	New		
Costumes – Opening ceremonies	Weight per item	Number of items	Textile (x % cotton, y % polyester)	New		
Costumes – Closing ceremonies			Textile (x % cotton, y % polyester)	New		
Sceneries – Opening ceremonies	Weight (kg)		Wood	New/ rented		
...						
Torch production and use						
Torches	Unit		Aluminium/ other metal	New	OCOG FA: Torch Relays	
Fuel for combustion of torches	litres		Propane/ butane			
Electricity consumption for torches/flame	kWh		Electricity			
...						
Torch production and use						
Security scanners	Unit		Aluminium/ other metal	Rented	OCOG FA: Security	Cross-reference with electrical equipment and IT services
X-rays (hand luggage)	Unit		Aluminium/ other metal	Rented		
...						

8.1.6 Transport of assets, materials and equipment

Table 50 on the following page outlines data to be collected, where it is reasonable to request activity data from suppliers, relating to the transport of assets, materials and equipment from suppliers to OCOG warehouses and venues.

* Where goods come via different transport modes (if known), it is important to record the distance travelled for each mode.

Notes

The weight of materials being delivered should normally be known. In cases where the suppliers cannot provide details of the weight but you know the number of units of each item received, their weight can be measured separately and added to the template above.

Loads and/or containers may often be part of a wider shipment that includes assets/goods destined for other organisations. In these cases, you need to know the weight or number of units actually being delivered to the OCOG. In cases where the entire load is destined for the OCOG, the most accurate measure is to note the fuel consumption per freight vehicle journey on a fully laden or part-laden basis.

Emissions for freight are commonly calculated from the total tonne-miles (mass of goods transported multiplied by how far the goods are transported). To calculate this, take the tonne-miles for each journey and sum this number up for all the journeys. This is known as the “sum product”.

The alternative method, which calculates the total mass for all journeys multiplied by the sum of the total distance for all journeys (known as the “product of sums”), should not be used, as it gives increasingly larger results compared with the sum product method as the number of journeys increase.

8.1.7 Staff and contractor travel associated with the Games project

Table 51 on the following page outlines data to be collected for staff and contractor travel associated with the Games project.

It is likely that multiple modes of transport may be used to complete a journey, with this detail being even harder to capture. It is therefore reasonable to identify the mode of transport used to cover the most distance within each journey and use it as the predominant mode.

TABLE 50: DATA RECORDING TEMPLATE FOR TRANSPORT OF ASSETS, MATERIALS AND EQUIPMENT FROM SUPPLIER TO OCOG WAREHOUSES AND VENUES

Type of asset, material or equipment	Weight of material, or number of items	Origin	Destination	Mode of transport (freight ship, truck, plane)*	Type of fuel	Fuel used per journey	Number of consignments (no of journeys)	Average distance per trip (one way)	Source
Unit	[tonnes] or [units]	[-]	[-]	[-]	[-]	Litres or kWh	Number	[km]	
[asset or material type]		[city, country]	[OCOG warehouse/ venue]						Supplier data or relevant OCOG FA
[Equipment Type]		[city, country]							
...									

TABLE 51: DATA RECORDING TEMPLATE FOR STAFF AND CONTRACTOR TRAVEL ASSOCIATED WITH THE GAMES PROJECT

Supplier	Origin	Number of people	Type of vehicle (car, rail, plane)	Type of fuel (if known)	Total number of trips	Average distance per trip (one way)	Source
Unit	[-]	[-]	[-]	[-]	[-]	[km]	
[Supplier 1]	[city, country]						Supplier data and context
[Supplier 2]	[city, country]						
[Supplier 3]							
[Type of workforce 1]							
[Type of workforce 2]							
...							

8.1.8 Employee commuting and homeworking

Table 52 below outlines data to be collected for employee commuting and homeworking. The assumption regarding predominant modes of transport as related to staff and contractor travel is also relevant here.

8.1.9 Financial flows of data

If no data are available for physical flows, it is possible to estimate GHG emissions based on financial flows. In this case, the list of data to be collected is much shorter, but the accuracy of a carbon footprint calculated based on financial flows is generally lower than a carbon footprint calculated with physical flows (see Table 53 below).

8.1.10 Catering

If no primary data are available, use the following averages. However, these proxy data can be used only for the initial carbon footprint. Primary data must be collected to calculate the actual carbon footprint.

8.1.11 Business travel and accommodation

Business-related travel and accommodation paid for by the OCOG is expected to be captured through a specific "expense of business travel" booking process. Conversations about the tracking of this information should be had early to ensure that the expense and/or booking system is optimised to collect the relevant data for carbon reporting. These systems can then be used to streamline reporting, making this data collection quicker and more efficient.

For completeness, the types of data required and their potential formats are outlined in the tables below.

TABLE 52: DATA RECORDING TEMPLATE FOR EMPLOYEE COMMUTING AND HOMEWORKING ASSOCIATED WITH THE GAMES PROJECT

Parameter	Unit	Amount	Number of years/months	Source
Employee commuting	Total number of trips per week, per mode of transport			Can use an employee commuting and homeworking survey to support the collection of data and insight; aiming for a representative sample size will support in filling any data gaps
	Total distance of a return journey (km)			
Employee homeworking	Per full-time employee (FTE) working hour			

TABLE 53: DATA RECORDING TEMPLATE FOR FINANCIAL FLOWS OF DATA ASSOCIATED WITH THE GAMES PROJECT

Parameter	Unit	Source
Budget for item/activity (cash)	USD (for example)	OCOG FA: Finance
Budget for item/activity (value in kind)	USD (for example)	
...		

TABLE 54: DATA RECORDING TEMPLATE FOR CATERING ASSOCIATED WITH THE GAMES PROJECT

Category of visitor	Parameter	Value
Athletes, NOCs	Amount of food per person per day[20]	2 average meals
	Amount of beverage per person per day	1 litre of non-alcoholic beverage 0.5 litres of alcoholic beverage
Workforce	Amount of food per person day	2 average meals
	Amount of beverage per person per day	1 litre of non-alcoholic beverage 0.5 litres of alcoholic beverage
Press and broadcast members	Amount of food per person per day	1 cold or hot snack
	Amount of beverage per person per day	0.5 litres of non-alcoholic beverage
Spectators	Amount of food per person day	1 cold or hot snack
	Amount of beverage per person per day	0.5 litres of non-alcoholic beverage
...		

TABLE 55: DATA RECORDING TEMPLATE FOR BUSINESS TRAVEL AND TRANSPORT OF OCOG EMPLOYEES OR REPRESENTATIVES

PLANES AND PUBLIC TRANSPORT

Origin	Destination	Mode of transport	Number of passengers	Average distance per trip (one way)	Source
[-]	[-]	[-]	[pers]	[km]	
[City, country]	[City, country]	Plane	XX	500	OCOG FA: Finance, Human Resources, Torch Relays
[City, country]	[City, country]	Train	XX	100	
[City, country]	[City, country]	Bus	XX	50	
...					

20 The breakfast is already included in “Accommodation”.

TABLE 56: DATA RECORDING TEMPLATE FOR CARS AND FLEET VEHICLES

CARS AND FLEET VEHICLES

Type of vehicle	Number of vehicles per type of vehicle	Type of fuel	Total fuel consumption per type of vehicle	Total distance travelled by the fleet	Source
[-]	[Unit]		[litres]	[km]	
Funded by the OCOG					
Bus/coach					OCOG FA: Finance, Human Resources, Torch Relays
Van					
Passenger car		Diesel/hybrid/ battery-electric			
Motorcycle					
...					
Not funded by the OCOG (sponsors vehicles)					
Bus/coach					OCOG sponsor/ delivery partner
Van					
Passenger car					
Motorcycle					
...					

TABLE 57: DATA RECORDING TEMPLATE FOR ACCOMMODATION

ACCOMMODATION

	Number of persons		Room nights	Source	Comment
Location	Under the responsibility of OCOG	Associated responsibility (sponsors, etc.)	[Total number of room nights]		
Hotel 1 [City, country]				OCOG FA: Torch Relays, Accommodation; Games delivery partners, suppliers and other stakeholders	
Hotel – medium hotel [city, country]					
Hotel – luxury hotel [city, country]		Diesel/hybrid/ battery-electric			
B&B					
Motel					
Apartment					
Student accommodation/ university campuses					
Other					
...					

8.2 Emission factor sources

This section presents some sources of emission factors that may be useful across some key and common activities covered within the methodology. The sources below are not in any way exhaustive, and it is recommended that as much as possible, emission factors relevant to the specific country are used. Nevertheless, these sources are provided as a starting point.

Example country-specific emission factor databases

UK Government conversion factors for company reporting of GHG emissions

This database of emission factors for GHG reporting are designed for use by UK and international organisations to report on certain GHG emissions. These emission factors are updated annually, with a new set published around June each year. This database includes emission factors for key activities such as:

- Energy consumption (fuels, biofuels, electricity, heating)
- Business travel (air, land, sea)
- Material use
- Waste disposal
- Water supply and treatment
- Freighting goods
- Homeworking
- Accommodation (hotel stays)
- "Well-to-tank" for energy and transport (accounts for the extraction, refining and transportation of the raw fuels before they are used)

Australian Government National Greenhouse Gas Accounts Factors

The National Greenhouse Accounts (NGA) Factors provides emission factors and methods that help companies and individuals estimate GHG emissions. Revised factors are published every year. This database includes emission factors for key activities such as:

- Energy consumption
- Waste disposal
- Water supply and treatment
- Transport (road, air)

United States Environmental Protection Agency – GHG Emission Factors Hub

The EPA's GHG Emission Factors Hub is designed to provide organisations with a regularly updated and easy-to-use set of default emission factors for organisational GHG reporting. This database includes emission factors for key activities such as:

- Energy consumption (fuel, electricity)
- Business travel (land, air)
- Transport and freighting (land, sea, air)
- Waste disposal

French Government: Impact CO_2

All data on the Impact CO_2 site, produced by the French Agency for Ecological Transition (ADEME), comes from ADEME's open data: Base Empreinte and Agribalyse. Impact CO_2 includes life-cycle emission factors across a number of activities, including:

- Transportation
- Food and drink
- Furniture
- Electrical equipment and appliances
- Clothing

Activity specific databases

- Other food and drink: eCarbonCloud's ClimateHub is an extensive climate footprint database of food product-related emission factors.
- Foodsteps' The Food Footprint 100 is a report on the carbon footprint of 100 typical foods and drinks in the UK.

The environmental impact evaluation of branding and signage solution for events

This IOC and UEFA document is specifically for branding and signage. It aims to compile and compare life cycle impact data for a range of branding, signage and overlay materials in order to help guide decisions regarding the sustainability of sourcing and end-of-life management of such materials.

Greenview hotel footprinting tool

Specifically for accommodation activities, this tool enables the creation of a carbon footprint for a hotel stay or meeting anywhere in the world, using real data supplied by the Cornell Hotel Sustainability Benchmarking (CHSB) Index 2024, the industry's global benchmarking index.

For overnight at the homes of friends or family, use the emission factor(s) set out in Table 58 below.

Materials and waste

For materials and waste, use the emission factors from credible sources, such as the UK Government conversion factors and the US EPA GHG Factors Hub. If there is recycled content in the materials (i.e. using secondary materials as inputs, such as for stadium seats produced from recycled plastic), use the emission factors by considering a weighted average of the percentage of virgin and recycled material.

For waste treatment, use the relevant emission factors for the appropriate type of end-of-life treatment (recycling, incineration, landfilling)[21].

TABLE 58: EMISSION FACTOR FOR OVERNIGHT STAYS AT FRIENDS OR FAMILY

Parameter	Emission factor	Unit
Overnight at friends or family house	0	$kgCO_2e$/overnight

21 Emission factors are calculated based on the allocation rules described in Product Environmental Footprint Category Rules Guidance, version 6.3 (European Commission, 2018).

9 ADDITIONAL MODELLING RULES FOR SPECIFIC TOPICS

It is necessary to define specific modelling rules for certain topics that must be applied for the entire study:

- Electricity – in particular, defining rules for the electricity mix, and for calculating the emission factor for a renewable electricity mix.
- Rented equipment – in particular, defining rules for modelling its GHG emissions compared to purchased equipment.
- Bio-based materials and fuels (e.g. wood, biofuels, cotton, etc.) – in particular, defining rules on how to consider biogenic carbon, which is the carbon that is incorporated into the biomass during growth (carbon uptake, the result of the photosynthesis effect) and can be released during decomposition or combustion at the end of life.
- Financial flows – in particular, defining rules to use emission factors from financial databases with current monetary value specific to the Games host country.

The rules to be applied for each of these topics are defined in sections 9.1 to 9.4.

9.1 Electricity

9.1.1 Electricity mix from the grid

When accounting for electricity consumption from the grid, it is best practice to include both a location-based and a market-based method within reporting.

"A location-based method reflects the average emissions intensity of grids on which energy consumption occurs (using mostly grid-average emission factor data). A market-based method reflects emissions from electricity that companies have purposefully chosen (or their lack of choice)." – GHG Protocol Scope 2 Guidance

This means that when calculating emissions based on a location-based approach, you should use the country-specific emission factors for national electricity consumption.

The market-based method is covered in the next section.

9.1.2 Production or purchase of renewable electricity

On-site renewable electricity sources should be included in the calculations when directly used by a facility/venue to offset grid electricity purchases. For example, include any investment made by the OCOG to build on-site renewable electricity installations, as well as any investment in the purchase of market-based instruments (e.g. renewable energy certificates (RECs) and power purchase agreements (PPAs)).

According to the market-based method described in the GHG Protocol, if qualifying contractual agreements for low-carbon electricity are purchased by the OCOG, the low-carbon emission factor must be used instead of the "average" emission factor for the region under two conditions:

1. Hydropower may not be accounted for as "certified renewable electricity" because in most cases, it represents large-scale existing dams and produces electricity that is already included in the regional/national mixes.
2. Certificates provided must be official certificates validated by official authorities (e.g. Guarantees of Origin in Europe, RECs in North America, I-REC (International REC) standards for other countries, etc.).

9.2 Rented equipment

GHG emissions related to rented equipment production must also be included in the Games' carbon footprint. However, unlike purchased equipment, for which 100 per cent of GHG emissions related to the production must be allocated to the Games, rented equipment may already have been used at other events and will be used for several other occasions after the Games. GHG emissions of rented equipment production should therefore be allocated to the Games as a portion of the equipment's life cycle.

Apply the following rules to calculate the GHG emissions for the embodied carbon element of rented assets:

- If using physical flows of data (number of materials), emissions allocated to the Games should be a proportion of the total embodied carbon emissions. This proportion should be based on an understanding of the total lifetime of the asset. This can be done in one of two ways depending on what is most appropriate for the context:
  1. Per number of uses within the asset's life cycle, with the Games counting as one use. For example, if an overlay and temporary infrastructure asset has a life expectancy of 25 uses over 10 years, then the emissions allocated to the Games is equal to the total embodied carbon emissions of the asset divided by 25.
  2. Per the period of time used as a proportion of the total life of the asset. For example, if a piece of electronic equipment has a life expectancy of five years and it is used for the Games for one year, then the emissions allocated to the Games is equal to the total embodied carbon emissions of the asset divided by five.

Note: This methodology does not apply to the transportation of rented assets from suppliers to the Games as transportation happens for each rented period. A proportional approach is only applied to the embodied carbon emissions element of the life cycle.

- If physical flows of data are not available, meaning financial flows must be used, then the full costs should be applied. It may be possible to break down the cost into different types of activity (e.g. cost for renting the asset, cost for transportation, etc.), meaning that the relevant financial flow emission factor can be used for each type of activity. If this breakdown is not available, then a singular emission factor is applied to the full financial cost.

9.3 Bio-based materials and fuels

A bio-based material is defined as a material made from substances derived from living (or once-living) organisms. It includes raw bio-based materials such as wood, vegetables and fruits (also called biotic materials), but also refers to modern materials that have undergone more extensive processing, such as cotton fibres, plastic made of cellulose fibres and fuels made from soya (e.g. biodiesel).

All these bio-based materials are composed of biogenic carbon, which is defined as the carbon that is taken up and incorporated in the biomass during growth (as the result of photosynthesis) and which can be released during decomposition or combustion at the end of life.

Direct GHG emissions from the combustion of biofuels and/or biomass feedstocks, as well as sequestered carbon associated with such types of bioenergy feedstock, must be included within the carbon footprint.

If biogenic carbon emissions from biofuels and/or biomass feedstocks are often "0" to account for the CO_2 emissions absorbed by fast-absorbing energy sources during their growth. Companies must report emissions from N_2O and CH_4 from bioenergy use under scope 1, 2, or 3, as required by the GHG Protocol. This is because these GHG emissions are not absorbed during growth.

Although the Scope 1 conversion factors contain a "0" value for CO_2 emissions, the impact of the CO_2 released through combustion of the fuel must be reported. Emission factors relating to this element are commonly available in databases and should be reported separately within carbon reporting as "outside of scopes". This ensures that the organisation is being transparent with regard to all potential sources of CO_2 from its activities. Emission factors can be found in databases such as the UK Government conversion factors (see "Bioenergy"). Further information can be found in the GHG Protocol land sector and removals guidance.

9.4 Financial flows

Using emission factors to account for inflation rate and conversion rate

If GHG emissions are calculated based on financial flows, using a dedicated economic input/output database[22], it could be relevant to consider the inflation rate and currency conversion rates when the modelling year and currency are different from those given by the background database. The approach for adjusting the difference is as follows:

- The average local inflation rate must be considered in order to know the value of the service across time periods. Inflation rates in various countries can be found here: http://www.inflation.eu/inflation-rates/cpi-inflation.aspx
- The exchange rate (http://fxtop.com/fr/historates.php) should be applied consistently with the chosen time period.

Additionally, an efficiency correction factor could be applied according to economic sectors across different locations.

Sponsorship and value in kind (VIK)

When considering financial flows based on sponsorship VIK values, be aware of highly inflated costing that can sometimes be associated with this, particularly relating to the Games. Where possible and available, it is recommended that cost prices are used to more accurately reflect the true value of the activity from an emissions perspective.

22 For example, the World Input-Output Database (see www.wiod.org).