

LOCOG Guidelines on Carbon Emissions of Products and Services – Version 1

There is now a strong scientific consensus, both on the severity of the threat that climate change poses to our lives and lifestyles, and on the role played by greenhouse gases, and in particular carbon dioxide (CO₂).

Almost all the products and services that we consume are responsible for causing carbon dioxide emissions, either through direct emissions across the supply chain or in the energy required for their production, transport and disposal.

A 'carbon footprint' is a measure of greenhouse gas emissions, and thus a way for organisations and individuals to assess their contribution to climate change. Understanding emissions, and where they come from, is the first step towards reducing them. In the past companies have focused on measuring their own emissions from fuel and electricity use, but they are increasingly concerned with emissions across their entire supply chain.

LOCOG is committed to minimising those greenhouse gas emissions which may arise from preparing and staging the Games. Understanding and addressing the full range of our impact is crucial if the impacts of climate change are to be minimised.

These guidelines are intended to provide supplemental advice to suppliers and licensees regarding the provisions of the Sustainable Sourcing Code that relate to energy and resource use. It is not meant to be fully comprehensive and cover every possible option or product.

What is a carbon footprint?

The carbon footprint is defined by the Carbon Trust as:

'The total set of greenhouse gas emissions caused directly and indirectly by an [individual, event, organisation, product] expressed as carbon dioxide equivalents (CO₂e).'

The full footprint of an organisation encompasses a wide range of emissions sources from direct use of fuels to indirect impacts such as employee travel or emissions from other organisations up and down the supply chain. Greenhouse gases include not only carbon dioxide but also methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆), which have an even greater impact on climate change and are measured in 'carbon dioxide equivalent' units.

When calculating an organisation's footprint it is important to try and quantify as full a range of emissions sources as possible in order to provide a complete picture of the organisation's impact.

In order to produce a reliable footprint, it is important to follow a structured process and to classify all the possible sources of emissions thoroughly.

A common classification is to group and report on emissions based on where the energy is used and where the emissions occur. On this basis, greenhouse gas (GHG) emissions can be classified into three main types :

1. Direct emissions: GHG emissions from greenhouse gas sources owned or controlled by the organisation;
2. Energy indirect emissions: GHG emissions from the generation of imported electricity, heat or steam consumed by the organisation; and
3. GHG emissions, other than energy indirect GHG emissions, which are a consequence of an organisation's activities, but arise from greenhouse gas sources that are owned or controlled by other organisations (eg: suppliers).

For products and services greenhouse gas emissions are typically caused by the direct and indirect use of energy and materials for their production, distribution, use and disposal. Reducing the consumption of energy and materials – through either efficiency improvements (for example, designing out waste or simply using less) or the substitution of alternatives with a lower environmental impact (for example, using natural, unprocessed materials) – are the main ways of minimising the carbon footprint.

Carbon footprint assessment

Calculating a carbon footprint for products and services can be quite a complex. Historically there has not been a single, consistent and internationally agreed method for calculation and reporting, and therefore can be difficult to compare published footprints.

The British Standards Institution (BSI) has recently published a relevant Publicly Available Specification, known as PAS 2050 ‘Specification for the assessment of the life cycle greenhouse gas emissions of goods and services’, sponsored by the Department for Environment, Food and Rural Affairs (Defra) and the Carbon Trust through an open and consultative process. This method offers a robust, consistent approach to calculating carbon footprints for individual products and services, adapting existing life cycle analysis standards to create a full measure of product-level GHG emissions. PAS 2050 and supporting guidance is available from the **BSI** website.

It is also possible to use a high-level analysis to estimate a basic footprint relatively quickly which can then be used to identify key drivers of GHG emissions or ‘hot-spots’ internally within the business or organisation (ie: where to focus action to reduce carbon emissions across the supply chain). Depending upon the outcome of the basic footprint the business or organisation can then determine whether a more rigorous carbon footprint assessment is required.

Given the limited experience many companies have in quantifying the carbon footprints of their products and services, LOCOG recommends its suppliers and licensees use either of the following approaches to determine product-level carbon footprints:

- Basic carbon footprint – high-level analysis specified in these Guidelines
- Full carbon footprint – PAS 2050-based analysis

Whichever approach is adopted it is important to comply with the following basic principles:

- Relevance – carefully select – and use – the most appropriate data and methodology
- Completeness – include all relevant GHG emissions
- Consistency – enable meaningful comparisons in GHG-related information
- Accuracy – reduce bias and uncertainties as far as is practical
- Transparency – disclose sufficient and appropriate GHG-related information to allow intended users to make decisions with reasonable confidence

Basic carbon footprint

Outline

This method is designed by LOCOG to provide a high-level approximation of a product carbon footprint without requiring extensive data collection and analysis. It uses secondary data to estimate the carbon emissions caused by the energy and materials used to provide your product or service. Secondary data is derived from existing life cycle databases. Using existing data avoids the need to undertake a detailed analysis of your own product or service supply chain. For simplification, this approach excludes emissions caused by the use and disposal phases of the life cycle. Though much simpler, footprint results will not be as precise or as complete as a full carbon footprint.

The basic carbon footprint approach described here is based on estimating three contributors to the overall footprint of your product or service:

1. Origination – emissions arising from the creation of the product or service. In the case of a product this would be related to raw materials and manufacturing process. For services, this would be the emissions from the office-based activities where the service is based and/or supported. Note that many offerings combine product and service elements.
2. Packaging – the materials used to protect and present the product or service which are discarded before use.
3. Transport – delivery of product or service. For example, freight or passenger transport from origination to point of use.

As previously stated, whilst this basic footprint approach excludes emissions caused by the use and disposal phases of the life cycle for some types of products and services it may be appropriate to consider in-use emissions (for example, for electrical appliances) and can either be estimated as an additional or standalone step in the process.

Note that not all elements will be relevant to all products and services. For example, providing an insurance service will require little or no transportation and packaging.

Determining your 'functional unit'

In the case of products, you will be measuring – in most cases – the footprint of a single item, for example, one postcard. This is technically referred to as the functional unit. Choose your functional unit for ease of comparison with alternative products. For example, you may actually find it easier to measure the impact of producing, shipping and packaging each box load of postcards but, for ease of comparison (since there is no standard number of postcards in a box), it is better to give your answer per postcard. This can easily be achieved by dividing the footprint for the box of postcards by the total number of cards in the box.

Choosing a functional unit for services can require a little more thought. Typically, the functional unit will closely resemble the breakdown provided in your response to tender. So, for example, if you provided your costs per hour of service then your functional unit will be an hour's worth of service. It may be that your tender breaks down by service type – for example, the delivery of an internet banking service. In this case the functional unit will probably be a year's-worth of internet banking. If delivering a security service, then you may well consider your functional unit to be one person-day of security. As with products, choose your functional unit to allow for easy comparison between competitive offerings.

Measuring the footprint

The basic carbon footprint method requires you to follow five steps and complete tables 1 to 3 for your product or service.

Each table relates to one of the three main contributors to the carbon footprint; origination, packaging and transport. The tables can be made available in a spreadsheet and copied and completed as many times as required.

Simplified carbon conversion factors for common materials are provided in Annexe 1 and a worked example is provided in Annexe 2.

Full carbon footprint

Accurate and complete calculation of a product carbon footprint requires a more detailed approach, as described in the PAS 2050 and its associated Implementation Guide. A systematic approach should be adopted and may comprise the following:

1. Build the process map
2. Define the boundary
3. Collect data
4. Calculate the footprint
5. Optional activities, such as quantifying uncertainty or verification and communication of results

It is recommended that PAS 2050 forms the basis for assessing the full carbon footprint of products and services.

Note that this 'Full Carbon Footprint' approach specified in PAS 2050 may well highlight cost and carbon savings opportunities which other, less detailed, methodologies may not. It could therefore be of wider value to potential suppliers and licensees to complete.

Further guidance and information

Further advice and information is available from the following resources:

The Carbon Trust

The Carbon Trust is a private company set up by Government in response to the threat of climate change, to accelerate the move to a low carbon economy. They work with UK business and the public sector to create practical business-focused solutions to help organisations in the path to becoming low carbon enterprises.

The Carbon Trust, along with Defra and BSI, have lead the development of the PAS 2050. The Carbon Trust has also developed an associated 'Code of Good Practice for emission and reduction claims' to specify requirements for communication and reduction calculations.

Their '**Carbon Footprinting**' guide provides an explanation of key footprinting concepts, a definition of the term 'carbon footprint' and an overview of the key issues in calculating an organisation's carbon impact, and an introduction to established corporate emissions reporting approaches.

The **Carbon Trust** have also recently launched the Carbon Trust Standard which certifies that an organisation has genuinely reduced its carbon footprint and is committed to making further reductions year on year.

Department for Environment, Food and Rural Affairs

Defra is the lead Government Department for climate change policy in the UK. They are also responsible to publishing approved UK conversion factors for energy to CO₂.

The **Defra** website has a lot of information about what climate change means for the UK and what it is doing about it.

The Greenhouse Gas (GHG) Protocol

The **GHG Protocol** is a widely used standard for emissions reporting and provides a methodology for calculating a carbon footprint. The protocol was developed by the World Resources Institute and the World Business Council for Sustainable Development.

Annexe 1: Simplified carbon conversion factors for common materials, transport, energy, and fuels

Common Material	CF (kgCO ₂ e per kg)
Aggregate, general	0.01
Aluminium, general	9.20
Brass, general	2.61
Bronze, general	4.41
Ceramics, general	0.69
Copper, general	3.22
Glass, general	0.90
Iron, general	2.08
Lead, general	1.41
Chromium	6.97
Cotton, padding	1.66
Cotton, fabric	8.77
Fibreglass (GRP)	8.87
Precious metal	6.69
General wool	0.19
Water	0.02
Paint, general	4.13
Paper and card, general	1.55
Plastics, general	3.09
Rubber, synthetic	4.39
Rubber, natural	1.78
Steel, general	1.91
Steel, stainless	6.44
Stone, general	0.06
Timber, general	0.47
Tin coated steel	2.10
Tin, general	14.52
Zinc, general	3.56
Food - plant-based	2.10
Food - animal-based	3.43

Sources: Bath ICE V1.6 and EcolIndex, Best Foot Forward.

Transport, Energy and Fuels	kgCO ₂ per kgkm	
Rail	0.00002	
Ship	0.00001	Average of all bulk carriers and container vessels
Air	0.00139	Average of domestic, short haul and long haul
Heavy Goods Vehicle (HGV)	0.00013	HGV average
Light Commercial Vehicle (LCV)	0.00028	Van/Light Commercial Vehicle average
	kgCO ₂ per vkm	
LCV	0.27	Van average
Car	0.20	Unknown car average
	kgCO ₂ per pkm	
Plane	0.14	Plane average of domestic/short/long haul
Bus/Coach	0.07	Average bus/coach
Train	0.07	Assumed Underground
	kgCO ₂ per kWh	
Gas	0.19	
Electricity (from grid)	0.54	
Electricity (from CHP)	0.3	
Fuel oil	0.27	
Wood pellets	0.03	
	kgCO ₂ per litre	
Diesel	2.63	
Petrol	2.32	

Adapted from Defra (June 2008) '**Guidelines to Defra's 2008 GHG Conversion Factors**'

Note: This list of greenhouse gas conversion factors contains many simplifications and approximations and should only be used for the Basic Carbon Footprinting method described here.

Annexe 2: Basic Carbon Footprint worked example – commemorative mug

STEP 1: Define and describe your 'functional unit'

Functional Unit:	Mug and packaging
Description:	A single commemorative ceramic mug packaged in a cardboard box with paper information leaflet enclosed
For products only, enter the weight of the functional unit (in kilogrammes) including packaging.	Mug (250g) Cardboard box (60g) Paper leaflet (5g) Total weight: 315g

STEP 2: Complete Tables 1a and/or 1b for your functional unit

Table 1a Origination (Products)

A	B	C	D	E
Type (Select from material table in Annexe 1)	Consumption (kg) (obtained by weighing the relevant part of the product)	CF(kgCO ₂ e per kg) (obtained from material table in Annexe 1)	Footprint (kgCO ₂ e) [calculated: B * C]	Notes
Ceramic	0.25	0.69	0.17	250g ceramic mug
Paper	0.005	1.55	0.01	5g paper leaflet
		Sub-total origination Footprint 1a (kgCO ₂ e) (sum Column D)	0.18	

Table 1b not required.

STEP 3: Complete Table 2 for your functional unit

Table 2: Packaging (products and some services)

A	B	C	D	E
Type (select from material table in Annexe 1)	Consumption (kg) (obtained by weighing the relevant part of the packaging)	CF(kgCO ₂ e per kg) (obtained from material table in Annexe 1)	Footprint (kgCO ₂ e) [calculated B * C]	Notes
Cardboard	0.06	1.55	0.09	Cardboard packaging (60 grammes) of mug
		Sub-total packaging footprint (kgCO ₂ e) (sum Column D)	0.09	

STEP 4: Complete Table 3a and/or 3b for your function unit

The packaged mug is shipped from East Asia (10,000 km) and then transported by road for 100km to the point of sale.

Table 3a Freight (products only)

A	B	C	D	E	Notes
Mode	Distance (km)	kgCO ₂ e per kgkm	Total weight of product and packaging (from Step 1)	Footprint (kgCO ₂ e) [calculated B * C * D]	
Rail	0	0.00002	0.315 (mug + box + leaflet) from Step 1	0.03	
Ship	10,000	0.00001			
Air	0	0.00139			
HGV	100	0.00013		< 0.00	
LCV*	0	0.00028			
			Sub-total freight Footprint (kgCO ₂ e)	0.03	

*LCV = light commercial vehicle

Table 3b not required.

STEP 5: Estimate the total footprint for your functional unit

Table 4: Total Footprint (kgCO₂e)

A	B
	Sub-totals – kgCO ₂ e
Table 1a	0.18
Table 1b	0
Table 2	0.09
Table 3a	0.03
Table 3b	0
Total Footprint (kgCO₂e)	0.3