

TRACE Methodology

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If you have any questions about this methodology, contact support@traceyour.events

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Introduction

Data collection is always a trade off between accuracy and usability.

TRACE aims to get the balance right between meaningful data capture and process simplification in order to create an 'out of the box' solution that standardises event measurement. The focus is on making it as easy as possible to enter data and provide meaningful analytics.

TRACE focuses on areas that event planners should reasonably be able to account for and that have the highest carbon impact, to make the platform as user-friendly as possible.

We recognise that collecting every single piece of data for an event would likely be so time consuming that many people wouldn't be able to measure anything at all. Plus, too much information can be prohibitive in providing any genuine insight into the impact of our events, and the reduction opportunities available - and reduction is the overall goal of carbon measurement.

The aim of TRACE is to provide visibility on the environmental impact of events and facilitate carbon and waste reduction through guidance provisioned within the platform.

TRACE allows users to calculate their carbon and waste footprint of events. This document outlines the technical methodology of TRACE.

TRACE will constantly evolve based on user feedback, improvements in technology and the ability and appetite of the events industry to collect carbon data.

Key terminology

There will be some unavoidable use of technical terms but where jargon is necessary, we break down what each term means.

- Emissions factors
- Scopes
- Life cycle analysis
 - Embodied carbon
 - Lifecycle emissions from fuels

Emissions factors

and how they are used to calculate CO₂e emissions

There are several greenhouse gases (GHGs) that have a warming effect on the planet when emitted, with carbon being the most widely recognised. Other gases, like Methane (M₄), Carbon Monoxide (CO) and Nitrous Oxide (N₂O), are converted into their 'equivalent' amount of carbon and this is expressed in **carbon dioxide equivalent emissions (CO₂e)**.

Anywhere in this document that refers to carbon emissions is referring to CO₂e.

Some things to know about CO₂e:

- It's usually expressed in tonnes (tCO₂e) but in some instances it is expressed in kilograms (kgCO₂e).
- To calculate the carbon footprint of a particular activity you multiply 'activity data' by an emissions factor to equal your CO₂e. For example:

$$\text{Estimated Activity Data} \times \text{Carbon Factor} = \text{CO}_2\text{e}$$

- Emissions factors are always expressed in kgCO₂e, such as kgCO₂e/mile (kgCO₂e per mile) for transport. For example, transport is calculated using the following equation:

$$\text{Distance travelled} \times \text{carbon factor of vehicle} = \text{CO}_2\text{e}$$

For an average petrol car, this looks like this:

$$10 \text{ miles} \times 0.35746 \text{ kgCO}_2\text{e/mile} = 3.5746 \text{ kgCO}_2\text{e}$$

Scopes

Scope 1, 2 and 3 is a way of categorising the different kinds of carbon emissions a company creates in its own operations, and in its event deliveries and wider value chain. The scopes are broadly broken down below:

Scope 1: Direct emissions

Example scope 1 emissions:

Emissions from 'owned or operated assets' e.g. gas combustion on site in gas boilers, catering gas equipment, diesel-powered generators, lighting, heaters etc., company-owned vehicles.

Scope 2: Indirect emissions from purchased electricity

Example scope 2 emissions:

Purchased electricity usage, and heat, steam or cooling that you buy and consume but are generated elsewhere.

In practice scope 2 emissions are usually purchased electricity and nothing else. These emissions are indirect because *someone else* has *directly burnt* fossil fuels to create the electricity that you're using.

Scope 3: All other indirect emissions - i.e. everything else!

Example scope 3 emissions

Audience travel and accommodation, staff travel and accommodation, event transport, Production: built items and graphics, Food and beverages, waste disposal / end of life

Life cycle analysis

In a carbon context, a lifecycle analysis refers to understanding the full life cycle of a product or item, and calculating the emissions associated with that life cycle.

For each item, boundaries are drawn, and emissions are captured for that relevant boundary.

In TRACE there have been boundaries drawn for each element being measured, but there has also been an assessment of an event's lifecycle and boundaries have been drawn based on what causes the largest impact, and what data can realistically and practically be captured.

Embodied carbon:

Embodied carbon comes from the consumption of embodied energy consumed to extract, refine, process, transport and fabricate a material or product (including buildings). It is often measured from cradle to (factory) gate, cradle to site (of use), or cradle to grave (end of life). The embodied carbon footprint is therefore the amount of carbon (CO₂ or CO_{2e} emission) to produce a material.

It is a topic of rising importance. In fact, it is normally possible to reduce the embodied energy and carbon of a building or construction project by 10-20% without adding to the build cost. What's more, embodied carbon is often 20-50%, or so, of the whole life energy and carbon of a building, i.e. when operational carbon emissions are considered.

Life cycle emissions from fuels

Fuel life cycle emissions (also sometimes referred to as 'Well-To-Tank', or simply (WTT) are the emissions 'upstream' from the point of use of the fuel. They result from the extraction, transport, refining, purification or conversion of primary fuels to fuels for direct use by end-users and the distribution of these fuels. They are classed as Scope 3 emissions according to the Greenhouse Gas (GHG) Protocol.

These factors are used for each specific fuel type or activity that results in burning fuel, such as driving a car. Therefore the following items in TRACE have a WTT factor as well as the main emissions factor:

- Electricity
- All fuels
- All vehicles

How to use this document

Format

This document is broken down into the following TRACE modules:

- Energy
- Production
- Waste
- Audience and Crew Transport and Accommodation
- Food and Drinks.

Each module is broken down as follows:

- Introduction - Summarises the scope of the module. If the module has been further broken into sub-modules, then these will be listed here.
- Definitions (optional) - Defines any terminology or abbreviations which are unique to the module (sometimes there aren't any).
- Required Data - Summarises the data which the user is required to enter, and a high level explanation of why this data is needed.
- Factors - Lists the sources for any data used by TRACE which is not entered by the user, for example emissions from a long haul flight, emissions from a diesel generator, portion sizes etc.

Energy

Introduction

Energy covers the measurement of electricity, gas, and any other fuels which may be required to provide power or heating to an event. TRACE distinguishes between calculations for utilities which are a permanent installation (mains), and temporary installations, because of the different fuel types used.

Data Entry

Mains Electricity & Gas

There are three different ways to collect mains electricity and gas usage data within TRACE. These ways are ordered from best to worst, and each one gives a less accurate measurement than the one before. Ideally the first will always be used, but we recognise that this is not always possible, and it is better to have estimated data than none at all.

Input from meter readings

TRACE uses this data to calculate energy usage in kWh, which is the standard metric used by electricity meters. For gas you can input data either in m³ or ft³ and these figures are converted into kWh usage.

Annual usage

If you can only collect your venue's annual energy usage data, e.g. from the venue's energy bill, you can input this into TRACE along with the size of venue and the size of the space that you hired. TRACE then estimates your energy usage and carbon footprint based on the number of days you hired the venue for, and the amount of space you used.

Estimate from type of venue

This option uses benchmark usage figures based on the venue type. TRACE then estimates the energy usage for your event based on the size of the venue and the number of days it has been hired for. These benchmarks are industry standard CIBSE (*Chartered Institution of Building Services Engineers*) benchmarks. CIBSE benchmarks are the best available benchmarks and are commonly used, but there is a longer term aim for TRACE to create industry benchmarks based on data which has been input into the platform.

Temporary Energy/Power

Usage of the fuels burned to provide temporary energy is collected to calculate the carbon emissions of temporary energy systems. Data is collected in the following format:

Fuel type	UK units	US units
Diesel	Litres	Gallons
HVO Biofuel	Litres	Gallons
Biodiesel	Litres	Gallons
GtL Fuel	Litres	Gallons
Bottled gas / LPG	kg	Lbs

Factors

Electricity factors are provided globally from the following sources:

Country	Emissions factor source
United Kingdom	DESNZ/DBEIS
United States	EPA
Germany	German Government
France	RTE
Italy	AIB
Netherlands	AIB
Spain	AIB
Rest of world	UN IFI harmonised grid factors

All other energy factors are provided by DESNZ and are relevant globally. TRACE currently measures the following fuel types:

- Gas usage
- Diesel
- HVO Biofuel
- Biodiesel
- GtL Fuel
- Bottled gas / LPG

Calculations

Electricity

The energy usage when estimated from a portion of the annual venue usage is:

$$(Annual\ usage / m^2\ of\ venue) \times m^2\ used / 365 \times number\ of\ days\ hired = energy\ usage$$

The energy usage when estimated from a venue type is:

$$Benchmark / 365 \times number\ of\ days\ used \times m^2\ used = energy\ usage$$

Electricity usage is classified as scope 2.

As electricity travels through the grid to people's homes, businesses and event venues, a small percentage is lost, because no energy transfer is 100% efficient. These are called transmission and distribution losses (T&D losses) and are classified as scope 3 emissions. Electricity usage has a WTT factor to account for the full lifecycle of the fuel and this is split into a WTT factor for the electricity usage itself and for the T&D losses.

If you are using renewable energy, this usage has an emissions factor of 0. Because renewable energy still comes through the grid, the T&D losses and the WTT factor from the T&D losses are still included in scope 3 emissions.

TRACE uses the 'location-based method' for providing emissions factors for electricity, which uses the average emissions intensity (emissions factor?) of the grid of a particular country or region. The market-based method reflects electricity supply from a particular electricity supplier. If you are using renewable energy TRACE rates the carbon emissions as 0 and this uses the market-based method. When submitting corporate emissions data for bodies such as the Carbon Disclosure Project (CDP) you are required to submit electricity emissions both in the location-based method and the market-based method. TRACE captures the location based data backend even if you use renewables. If you don't use renewables, we can help you capture the market-based emissions separately and help you compile your corporate emissions reporting.

Gas usage and other fuels

Gas usage and diesel are scope 1 and do not have any T&D losses.

Production (Materials)

Introduction

TRACE separates production material usage into two categories: Built items and Graphics. For both these categories, the embodied carbon of each material is accounted for.

TRACE measures materials from cradle to (factory) gate. As TRACE is used globally and material transport emissions vary greatly, it is logical and standard practice to use this boundary for materials use.

The transport from your contractor to the event site and back should be captured in your contractor event transport section.

Data input

For both modules there is an option to select:

- Material type
- Material weight
- Material source *i.e. virgin material or recycled material*
- Onward life

Built items

Material usage is input in weight and multiplied by the relevant emissions factor to calculate the CO₂e emissions.

Graphics

Graphics materials can come in different thicknesses and thinner materials emit less carbon because they weigh less. For this reason the data entry fields are

- Metres squared
- Gsm (grams per square metre)

The numbers are multiplied together to create overall material weight and this can be used to calculate the CO₂e emissions. If you have the weight of a material but not the other information, you can input the weight straight into the platform.

Factors

The emissions factors used for built items are from the [ICE database](#) except for Dibond, fabric - hemp and fabric - polyester which were provided by Anthesis.

Emissions factors for graphics materials come from Life Cycle Analysis (LCA) modelling conducted by carbon consultancy Anthesis. This modelling was part of a report commissioned by the International Olympics Committee (IOC), UEFA and The Ocean race on the impact of Graphics materials in the events industry.

The Anthesis (LCA) modelling utilised a mixture of the Ecoinvent database and supplier product sheets to create the emissions factors. The emissions from printing onto materials are included within the graphics materials.

Calculations

The ICE database does not provide factors for recycled materials so currently if you select a recycled material it won't affect the carbon footprint for that material. However this is something we are looking to expand on in the future.

If the material source is reclaimed or reused, or hired stock, this is counted as zero carbon, as the embodied carbon associated with the construction of that material has already been accounted for in its first use.

End of life options within the built items and graphics modules

There are also emissions associated with the onward life of a material.

As the onward life for built items and graphics are often managed by the supplier that manufactured them, separately to the venue's waste management systems TRACE supports both onward life options.

If the options 'supplier removed for recycling' or 'supplier removed for disposal (landfill / incineration)' are selected, the emissions from onward life are captured as part of the production materials lifecycle.

To avoid double counting waste and waste emissions, if the onward life of a material is managed by the venue or waste management contract along with the rest of an event's waste, there is an option to select 'into waste/recycling' for a material's onward life. No emissions for this material would then be captured individually as this would already be accounted for in overall waste emissions in the waste management section.

You must complete the Waste Management section in order for the waste emissions of any items labelled 'into waste/recycling' to be counted.

Waste management

Introduction

There are three different material end of life options within TRACE:

- Recycled*
- Sent to landfill
- Sent to incineration for energy recovery

There are different boundaries set for the different waste options. Landfill waste accounts for collection, transportation and landfill emissions ('gate to grave'). For incineration and recycling, the factors consider transport to an energy recovery or materials reclamation facility only. This is in line with GHG Protocol Guidelines, with subsequent emissions attributed to electricity generation or recycled material production respectively. Due to this, it is advisable to use the end of life emissions calculations for reporting purposes only, and not to analyse the merits of different end of life options.

When assessing onward life options, consider the Circular Economy. This prioritises diversion from landfill and incineration, followed by reusing, repurposing and finally recycling. For more information on event industry best practice, visit www.proseed.events

*This definition of recycling covers composting/Anaerobic digestion. The boundary for composting and anaerobic digestion is the same as for incineration and recycling in that only the emissions associated with collecting and transporting the goods to the relevant facility are included within the emissions factor

Data input

TRACE offers several different options for collecting this data to make it easier for event planners.

By weight of each material type

This is the most accurate way to collect waste data. Separating waste at source also reduces the chance of contaminating materials sent to recycling, as long as your waste contractor doesn't just mix them all up again in a compactor!

Material types are separated as follows:

General waste

General waste is classified as mixed waste that is sent to landfill or to be incinerated for energy. There is an option to select the split of landfill and incineration of general waste if you know this. This can vary depending on the location of the event, waste contractor and local authority, and so TRACE allows the user to input the split between these processes. However, as many event planners may not have this information readily available TRACE will assume a split taken from a UK national average for the current year, unless overridden manually.

TRACE uses data from the 'Waste in the UK Hospitality and Food Service Sector' by WRAP to estimate the split of mixed materials to provide emissions for general waste.

Recycled materials

- Plastic
- Paper
- Glass
- Metal
- Fabric
- Wood
- Food Waste

TRACE assumes that 100% of the materials entered into the recycled materials are actually recycled so if you have material weights and recycling rates for each material from your waste contractor, you should use these to get to the 'true' recycled materials figure, and all the remaining weight to your general waste section.

Mixed recyclable materials - *i.e. if you haven't separated your materials*

TRACE uses data from the 'Waste in the UK Hospitality and Food Service Sector' by WRAP to estimate the split of mixed materials to provide emissions for mixed recycling.

By total volume of all filled bins

It can be difficult to collect waste weights and sometimes it is only possible to collect the number and type of bins used.

TRACE allows you to enter data in litres which is then converted into kilograms back-end. TRACE uses conversion factors provided by the Environment Agency to convert litre data of the relevant materials into kilograms

Factors

Factors for waste disposal are taken from DESNZ. As per DESNZ guidance, the emissions from waste should be used for reporting purposes only and not to evaluate different waste disposal options.

Event Transport

Introduction

This module covers the transport of everything except people, to and from an event. There are four sub modules within Event Transport:

- Contractor transport
- Company owned transport
- Dedicated couriers
- Freight transport

Data input

Contractor and company owned transport both have exactly the same data entry options:

Small/Medium Van

7.5T

7.5 - 17 T

> 17 T

Artic Lorry

HGV

Dedicated couriers can be used for smaller vehicles:

Bicycle

Motorbike

Car

Small/Medium Van

Freight transport is used for air freight, shipping freight and road freight when sending packages by weight. The data entry options are:

Cargo ship

Air freight (Short haul)

Air freight (Long haul)

Ro-Ro ship

HGV

Factors

Emissions factors are taken from DESNZ which are relevant globally.

Audience Travel and Accommodation

Introduction

This module is split into three sections:

- Audience Travel excluding flights
- Audience Flights
- Accommodation

Data Input

Non-Flight Emissions

TRACE calculates the distance of each journey based on the start and end point input by the user, (or based on the mileage entered by the user if done manually).

Flight Emissions

TRACE calculates the distance of each journey based on the start and end point inputted by the user, (or based on the mileage entered by the user if done manually) and selects the appropriate type of flight.

Audience Travel excluding flights

This section follows the same logic and calculations as the event transport section, with a different set of vehicles.

Vehicles that are generally used for private journeys are based on emissions factors per vehicle trip:

- Bicycle
- Car - Diesel
- Car - Electric
- Car - Plug-in Hybrid
- Car - Hybrid
- Car - Petrol
- Car - unknown type
- Van - Diesel

- Van - Electric
- Van - Petrol
- Van - Biodiesel
- Van - unknown type
- Motorbike
- Private jet
- Taxi - Black cab
- Taxi - Regular
- Walk
- Other

Public Transport factors are based on emissions per passenger trip:

- Bus
- Coach
- Train - Light rail and tram
- Train - International rail
- Train - Underground/Subway
- Train - National rail
- Flights except private jet

The flights section works as follows:

You select the class, number of trips, and the start and end point of a journey.

The Google Maps API calculates the distance of the journey or it is possible to write the mileage manually.

Emissions Factors

All transport factors come from DESNZ.

Flight Emissions

DESNZ provides factors for different length trips and classifies them as:

- Domestic flight (within UK)
- To/from Europe
- International

The factors are based on the distance of each flight as the emissions per mile reduces significantly on longer trips, due to fuel efficiencies and the fuel required for takeoff and landing. The DESNZ factors are split as below

DBEIS factor	Distance (miles)	TRACE classification
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Short haul / Domestic flight (within UK)	<497	Short haul
Medium haul / To / from Europe	497 - 2299.073	Medium haul
Long Haul / International	>2299.073	Long haul

TRACE applies the appropriate factor depending on the mileage of each journey.

Private jet factor

The private jet factor has used DESNZ/DBEIS's Aviation turbine fuel emissions factor to calculate the per km private jet factor, with an applied uplift of 1.9 to account for the radiative forcing effects of aeroplanes. (This uplift is applied by DEFRA/DESNZ/DBEIS to their emissions factors for commercial flights.)

As the aviation turbine fuel factor is a per litre factor, an average mile per litre value for private jets has been calculated. The average mile per litre will vary significantly depending on the size of the private jet. TRACE has used a common, midsize jet (Hawker 750) as an example of a representative average size jet for the purposes of its calculations. The average mile per litre value is derived from the average, long-range speed of the plane and the average fuel burn.

The kgCO₂e/mile factor was derived using the following equation:

$$\text{Emissions per litre} / \text{miles per litre}$$

Accommodation

Emissions factors are sourced from The Cornell Hotel Sustainability Benchmarking Index, compiled by Greenview.

Greenview states that approximately 75% of a hotel's energy use is electricity and therefore if you choose a hotel that uses renewable energy, the emissions are reduced by 75%. This assumes equivalent CO₂e/kWh factors for all energy sources. It is a simplification which has been deemed reasonable given the available data.

Estimated travel and accommodation

This option gives users the ability to estimate audience travel and accommodation because it is such a significant driver of carbon emissions and historically has been difficult to track.

Average emission factors for the following items have been calculated:

- Medium Haul flights

- Long Haul flights
- Tube/Bus average
- Train/Coach average
- Taxi average

Crew Travel and Accommodation

This module follows the exact same logic as the audience travel and accommodation section except that there isn't an option to estimate it.

TRACE is designed to support event professionals to both capture their carbon and waste data, but also support behavioural change and industry transformation. As such, we have not provided the ability to estimate crew travel and accommodation because access to this information should be within the direct control of the event owner, organiser or contractor. It is reasonable to request travel and accommodation information from crew if it is not being arranged on their behalf and should be built into contracts and communications. In this way, an accurate picture of carbon from crew travel and accommodation can be established.

Food and beverages

Introduction

This module is split into three sections:

- Audience catering
- Staff catering
- Beverages

Data Input

Food

To simplify data collection for event planners TRACE uses average meals for 4 dietary types, as the average emissions can be grouped similarly:

- Beef/Lamb
- Other Meat, Fish and Seafood

- Vegetarian
- Plant based/Vegan

Meal options have also been broken down:

- Breakfast - cooked
- Breakfast - continental/cold
- Sit down Starter
- Sit down Mains
- Sit down Dessert
- Street food / Trader Truck Mains
- Bowl Food
- Lunch Box Style
- Buffet
- Canapes
- Samples

Staff catering options have been simplified further

- Breakfast cooked
- Breakfast Continental / Cold
- Mains
- Lunch Box Style
- Desserts

Serveware

The following serveware options are available:

Food (plates):

- Single use plastic
- Single use card
- Single use bamboo, wood, similar
- Compostable (in food waste)

Beverages (cups):

- Single use plastic cup
- Card cup
- Compostable (in food waste)

Factors

Food

As food carbon footprinting is so complex and different methodologies can vary significantly, TRACE looked at several different food LCAs and averaged them to create benchmark emission factors for each meal choice.

The factors use a cradle-to-gate LCA model. This accounts for transport up until the point of retail.

Carbon factors are based on global averages of these food types and do not take into account seasonality or locality at this stage.

The factors chosen have been based on an average of the values of factors provided by:

- C-Level
- Avieco
- Syntiro Associates
- Olympic Organising Committee
- We are Albert

Breakfast and lunch box factors were calculated using specific recipes.

All other factors were calculated by using the factor for main meals and multiplying it by the weight of the benchmark portion size.

Benchmark portion weights and sources

Meal type	Benchmark portion weight (grams)	Source of weight benchmark
Breakfast - cooked	333	Syntiro - provided full recipe with weights
Breakfast - continental/cold	333	Syntiro - provided full recipe with weights
Sit down Starter	200	Syntiro - provided full recipe with weights
Sit down Mains	412	Syntiro - provided full recipe with weights
Sit down Dessert	135	Syntiro - provided full recipe with weights
Street food / Trader Truck Mains	374	Syntiro - provided full recipe with weights
Bowl Food	300	Estimate
Lunch Box Style	230	Syntiro - provided full recipe with weights
Buffet	600	Estimate based on research that buffets often

		are up to 50% larger than main meals
Canapes	35	Estimate
Samples	20	Estimate

Emissions factors food sources are from

- Our World in Data dataset (Poore & Nemecek, 2018)
- World Food LCA Database (2015)

Beverages

To allow analysis of the impact of different packaging types on overall emissions, TRACE has derived separate factors for the beverages and their packaging. The methodology used is outlined below. The methodology accounts for the container type of a beverage but not any additional packaging. i.e. it calculates the impact of a glass beer bottle but not the cardboard packaging used when the bottles are sold in packs of six.

The emissions factors for beverages combine the emissions for the production and transportation of the beverage itself and the emissions for the production of packaging materials. This allows users to understand the impact of choosing different packaging types when purchasing beverages.

The emissions factors for Wine, Beer, Soft drinks, Water, and Spirits are all sourced from the Beverage Industry Environmental (BIE) Roundtable. As the BIE has not produced an emissions factor for hot drinks, the Our World in Data (Poore & Nemecek, 2018) factor for coffee was used.

The emissions factors for the packaging are sourced from the ICE database.

Serveware

Weights of these items were taken from product datasheets and emissions factors were calculated by multiplying the weight by the relevant emissions factor from the ICE database.

Any reusable items such as china plates and metal cutlery are zero rated. This is consistent with the approach taken to reused and hired materials in built items and graphics.

The waste emissions from disposing of the serveware and packaging are captured only in the waste management section to avoid double counting.

Online event

The TRACE online event methodology follows the IEA methodology described at this [link](#)

Verification

Independent sustainability consultancy, [Avieco](#), were commissioned to review and confirm that the methodological approach is conformant with the WRI GHG Protocol and that the emissions factors used within the platform are appropriate and up to date