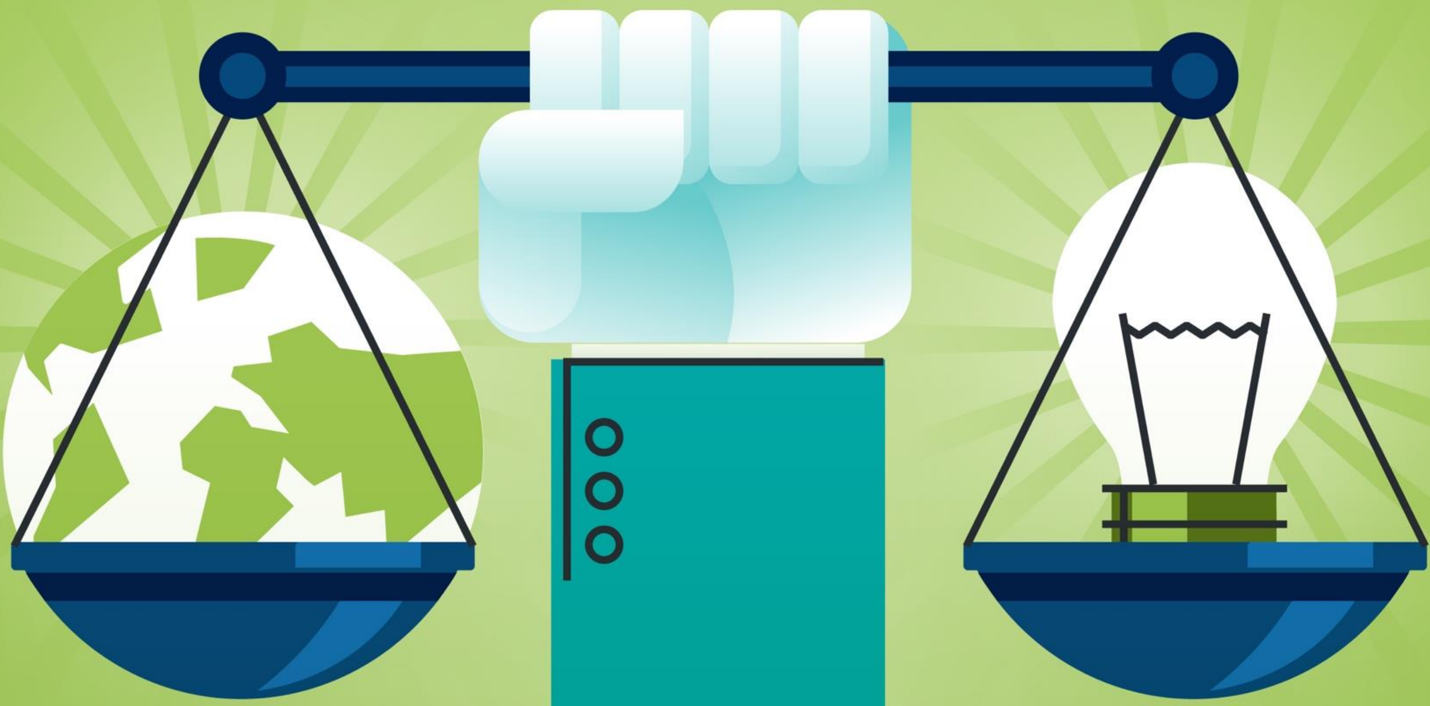
NET ZERO CARBON EVENTS



NZCE Measurement Methodology

1st Edition December 2023

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EXECUTIVE SUMMARY

The Net Zero Carbon Events (NZCE) initiative launched a pledge in November 2021 that empowers stakeholders from the event industry, and primarily event operators (organisers, venues, and service providers) to take responsibility for reducing the environmental impact of events. A roadmap that sets out a common framework for event stakeholders to progress towards net zero together was then developed and released in November 2022. As of November 2023, more than 600 industry stakeholders in over 60 countries are supporting the initiative.

As part of the NZCE pledge, signatories have committed to the following four actions:

- Before the end of 2023, publish the organisation's pathway to achieve net zero by 2050 at the latest, with an interim target in line with the Paris Agreement's requirement to reduce global GHG emissions by 50% by 2030.
- Collaborate with partners, suppliers, and customers to drive change across the value chain.
- Measure and track Scope 1, 2 and 3 GHG emissions according to industry best practices.
- Report on progress at least every two years.

A collaborative, cross-industry approach is more important than ever since this allows comparability of different data streams and simplifies measurement processes for event industry actors, who are likely already stressed for time and resources. In turn, the events industry can then focus more time on decarbonising their events. Change must be driven throughout the entire events value chain. Making the systemic change possible requires a firm scientific basis to identify high emissions activities. Therefore, measurement is critical.

Eight workstreams were created as a result of the NZCE Roadmap to support the events industry in the decarbonisation of the five defined action areas: Venue Energy; Food and Food Waste; Logistics; Smart Production and Waste Management; and Travel and Accommodation and to provide guidance on the three transversal issues of Reporting, Offsetting, and Measurement. The Measurement Workstream set out to create a common methodology for emissions measurement in the event-specific context and we are proud to present the first version of this methodology to you. To read the documents that the other workstreams have produced, please visit the NZCE initiative's resources page.

This first edition of the measurement methodology aims to support signatories in meeting all commitments of the NZCE pledge as a starting point for measurement. Further specificity, resources, coefficients, and common approaches for items within it will be developed in the next phase of NZCE. The pages ahead provide an overview of this initial methodology for measuring the event's direct and indirect greenhouse gas emissions at event-level, regardless of the event type. Where possible, the methodology already includes granular and specific metrics, formulae, and flow charts that will assist NZCE supporters in making calculations required for reporting of their carbon emissions. The methodology will be updated in subsequent versions to include more specific guidance particularly for secondary data, coefficients, estimation, and extrapolation of data.

HOW TO USE THE METHODOLOGY

The NZCE Measurement Methodology serves as an essential source for understanding and quantifying event-level emissions. It provides guidance on measurement for the main identified event emission source categories. As a result, this document is extensive, and it is critical to note that not all information included may be relevant to all event stakeholders. Accordingly, organisations should determine their material activities and draw boundaries accordingly. This methodology can then be used for measurement of the specific emission source categories the organisation has identified as material.

The methodology restricts its focus on "how" to quantify event-level emissions and guidance on "which" stakeholder has control and responsibility on the nine emission categories will be addressed in subsequent resources from NZCE and incorporated into this methodology as a follow-up to the NZCE Roadmap that outlines stakeholder responsibilities and prioritisation for each action area.

ALIGNMENT WITH THE GHG PROTOCOL

The methodology does not follow the GHG Protocol Corporate Reporting Standard with its terminology of Scope 1, 2, or 3. An event can more easily be approached as a product, as many different companies from different industries, with their respective emissions sources, processes, and materials, come together to create an event. As such, this methodology uses the GHG Product Life Cycle Accounting and Reporting Standard as a foundation because it is more fitting to understand the full lifecycle of emissions created before, during, and after an event, regardless of the responsibilities of different stakeholders.

NINE EMISSION SOURCE CATEGORIES

Based on an in-depth analysis of current practices in and resources from the events industry, a total of nine categories of sources of emission activities have been identified that can occur through the lifecycle of an event i.e., *Production and Materials, Freight and Logistics, Food and Beverage, Travel to and from the Destination, Local Transportation, Accommodation, Energy, Waste, and Digital Content and Communication*.

These emission source categories will usually fall into the time frames of the event lifecycle as seen in **Figure 1 on p.12**. However, as a result of the diversity of the events industry, this might be different for each event and as mentioned above, stakeholders should adapt this for their own event context.

The methodology provides in depth information about the impact of each of these emission source categories, the primary data to be collected for measurement, formulae for converting this data into emissions, emission factor sources, secondary data examples, apportionment considerations, illustrative examples, and measurement considerations according to different tiers.

MEASUREMENT TIERS

Though primary data is preferred for measuring emissions, accurately quantifying emissions from each of the nine categories and covering 100% of the boundary with primary data is rarely possible or feasible for events. Therefore, the methodology introduces a three-tier system that enables a starting point for measuring events and addresses each entity's net zero journey from "beginner" to "advanced". Different stakeholders might be able to progress more quickly through the tiers than others and some might already be able to use the advanced tier at the point of publication of this document. In order for the events industry to decarbonise as efficiently as possible, all stakeholders should work actively on progressing to the advanced measurement tier. **Figure 2 on p.14** shows the details of the three tiers.

ADDITIONAL RESOURCES

In addition to the guidance on the nine emission source categories, this methodology also provides guidance on key event level metrics to disclose in reporting, extrapolation for multiple events, and considerations for baseline setting.

KEY ISSUES RAISED FOR FURTHER DEVELOPMENT

It is recognised that this first edition of the measurement methodology will not be able to cover and address all measurement-related issues in the events industry. Therefore, the methodology takes the approach of documenting each issue so that these can be deliberated and vetted within the other NZCE workstreams. Improvements and updates will then be made in subsequent versions. The main issues that have not yet been included in this version include:

- Specific emission sources, such as emissions of water supply and distribution, embodied carbon of the venue or building, scope 1 and 2 of event organisers' workplaces and offices, and Food & Beverages purchased by attendees at venue cafés or food trucks.
- Timeline considerations for the three measurement tiers
- Years to defer baseline for emission categories
- Apportionment on materials such as carpets, furniture, rental equipment, and shell scheme, etc.

The last issue that will be taken up in future versions of this methodology is that of **Coefficients and Proxy Data**. The NZCE measurement team has started collecting data from supporters of the initiative. At time of the release of this methodology, the data provided does not yet allow the creation of conclusive industry coefficients. The initiative will continue to collect data to enable the creation of industry coefficients for the next version of this methodology. If your organisation has event-level data to share for any of the nine identified emission source categories, please reach out to us at info@netzerocarbonevents.org.

The NZCE initiative will also continue looking into other measurement related projects, such as a Materials Library and a Venue Data Exchange. These projects are also highlighted in the Smart Production and Waste Management and the Venue Energy Guidance Documents published alongside this methodology.

Should you have any questions about this methodology, please contact us at info@netzerocarbonevents.org.

ACKNOWLEDGEMENTS

The first edition of the NZCE Measurement Methodology has been developed by the Measurement Workstream as part of the NZCE Phase 3. The methodology is the result of an extensive process that ran throughout 2023 in which workstream members and industry experts were consulted in a series of stepwise feedback rounds via various communication channels. Their feedback and suggestions were then incorporated into this final version of the methodology. This collaborative process would not have been possible without the substantial contributions of the various stakeholders below to whom NZCE would like to express gratitude.

Measurement Workstream Leaders: UFI & Greenview

Measurement Workstream Members: American Express Global Business Travel, Clarion Events, Easyfairs, Emerald, Exhibition Services & Contractors Association, European Exhibition Industry Alliance, Event Greening Forum, Fiera Milano, Freeman, German Convention Bureau, Green Circle Solutions, Green Evénements, Honeycomb Strategies, ICE-Hub, Informa Markets, International Federation of Exhibition & Event Services, Javits Center, Joint Meeting Industry Council, Maritz, Reduce2, Polish Chamber of Exhibition Industry, RX, Triumph Group International, UNIMEV, UNFCCC

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1 INTRODUCTION

1.1 WHY IS THIS METHODOLOGY NEEDED

Events contribute significant value to society. By creating opportunities for human connection and collaboration on issues ranging from politics and business to leisure, they create both social and economic benefits. However, events, whether they are sporting events, music festivals, conferences, or large-scale gatherings, often generate significant greenhouse gas emissions throughout their lifecycle, from planning and preparation to execution and wrap-up. These emissions arise from various sources, including transportation and lodging of attendees[1], production and transportation of exhibits and other event materials, venue usage, catering of events, digital content and communication used for the event, and the emissions resulting from activities of all the entities involved in organising and supporting an event.

The complexity of the various entities involved in the footprint of an event presents some challenges for measuring emissions due to lack of data access, lack of cohesion across measurement approaches, complexity of measurement needs across various sources of emissions which involve multiple other sectors, and significant overlaps in terms of influence and control among different entities, without easily coordinated data flows. The events industry is aware of its responsibility in reducing carbon emissions and as a result, the Net Zero Carbon Events (NZCE) initiative, with its current 600-plus supporters in over 60 countries (November 2023), launched the pledge at COP26 in 2021. In addition to the pledge, the initiative identified the creation of a common measurement methodology for all stakeholders in the global events industry as a priority action in their Roadmap published at COP27 in 2022.

A comprehensive **event-level** methodology for calculating emission from events is essential for several reasons:

- It builds awareness among different stakeholders regarding various issues of measurement, quantification, and metrics associated with an event – in particular for moving to net zero – which has been lacking in the event community.
- It enables event organisers, policymakers, and stakeholders to gain a comprehensive understanding of the carbon footprint associated with events. This understanding forms the basis for informed decision-making, allowing for the implementation of effective mitigation strategies. By quantifying emissions accurately, the methodology facilitates comparisons between different events and helps identify areas where emissions reduction efforts can be prioritised.
- A standardised methodology provides consistency and comparability across various events, sectors, and geographic locations. Such uniformity allows for the aggregation and analysis of data at a global scale, enabling policymakers and researchers to identify trends, patterns, and hotspots of emissions. This information is vital for the formulation and evaluation of climate policies and strategies targeting the event industry specifically.
- A robust methodology encourages accountability and transparency among event organisers. By incorporating emission calculations into the planning and reporting process, organisers can make informed choices regarding venue selection, transportation options, waste management, and energy usage. These considerations not only minimise the environmental impact of events but also contribute to the overall sustainability and social responsibility of the hosting organisation.

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[1] While the transportation of attendees is among the highest emissions sources for most type of events, it also appears that some events deliver a strong “travel consolidator” effect, whereby they provide an efficient operating model for whole industries to meet in person and accomplish many things in one location over an agreed time instead of flying to individual meetings across the world, and as a result might provide “reduced travel”.

As part of the NZCE Initiative, this methodology is created by the industry for the industry and aims to provide:

1. **Standard approaches for measuring the upstream and downstream emissions** of events.
2. **Consistent metrics for various primary and secondary data points** ranging from event details, production and materials, freight and logistics, food and beverage, travel to and from the destination, transport within the destination, energy, accommodation, waste, and digital content and communication.
3. **Creation of common industry coefficients for measuring the carbon footprint of events** to enable measurement of event activities where data is difficult to obtain. Please find more information about the status of coefficients in this methodology version in Appendix F.

This methodology seeks to serve as the referential methodology for all stakeholders in the event industry and for all types of events ranging from business events, such as trade shows, conferences, and exhibitions to leisure-related events, such as festivals, live music, and sporting events, to gatherings of teams or families. A special focus has been put on the stakeholder groups of organisers, venues, and service providers as they usually are the most directly involved in the delivery of an event.

Methodologies, protocols, and standards evolve over time. The complexity of event types and configurations, carbon data boundaries, quantification, assigned responsibilities, and general lack of representative unity across the event industry globally toward these aims has inhibited measurement, let alone consistency, for several years. As such, this methodology is developed to enable a starting point for the large body of industry practitioners to pursue measurement, and for the NZCE initiative to rally data, feedback, and collaboration to routinely improve it over time. This movement, coupled with the advanced practices of a few key entities including many in the Measurement Workstream, will have the mandate to continuously improve in specificity, guidance, and resources such as industry coefficients going forward. Ultimately, this methodology aims to enable industry-wide cohesion in measurement to combat the abovementioned issues of comparability and to enable a streamlined approach of the events industry to net zero.

1.2 HOW SHOULD THIS METHODOLOGY BE USED

Measuring and reporting on the emissions of an *event* is different from measuring and reporting on emissions of an *organisation* following the GHG Protocol Corporate Reporting Standard, which categorises emissions into different scopes (scope 1, 2, or 3) depending on how the emission source relates to the measuring and reporting organisation. An event can more easily be approached as a *product,* as many different companies from different industries, with their respective emissions sources, processes, and materials, come together to create an event. As such, this methodology uses the GHG Product Life Cycle Accounting and Reporting Standard as a foundation because it is a more fitting approach to understand the full lifecycle of emissions created before, during, and after an event, regardless of the responsibility for which the respective emissions should be assigned.

Each category of event emissions should be addressed, using the guidance to orient and structure their calculations. Users may choose the level of which to follow the methodology based on these factors, following the general tiered structure of basic, intermediate, and advanced measurement as best fit. In many cases, some categories of the event may be measured in an advanced tier and others basic. This is acceptable as the intention is to start measuring and improve in each area over time. Users should transparently cite their assumptions and coefficients used, taking into consideration the recommendations provided.

This methodology uses the metric system for cohesion. Should your organisation not use the metric system, your organisation may convert the formulae highlighted throughout this document into your preferred units. As always, make sure to report on this transparently to enable comparisons later on.

2 SETTING BOUNDARIES

2.1 TEMPORAL BOUNDARY

Depending on the type or scale, an event does not happen just on the day(s) it actually takes place. Conceptualisation and preparation of an event starts days/weeks/months before the actual date of the event. After the event, several post-event activities also take place. Therefore, this methodology accounts for the full life cycle emissions of the event from pre-event, event, and post-event phases.

Note that the temporal boundary and the sub-processes within the three categories may not be applicable universally for all types of events and therefore each event's temporal boundary may need to be considered and transparently disclosed on a case-to-case basis.

2.2 SOURCES AND BOUNDARY OF EVENT EMISSIONS

The delivery of the final event is similar to a finished product/service, for which several interconnected processes and stakeholders generate emissions during a life cycle. Generally, a finished product's emissions are generated from the cradle-to-grave life cycle stages of material acquisition, production, distribution and storage, use, to the end-of-life stage. However, the life cycle of an event is slightly different as it has its own set of emissions from activities specifically associated with delivering an event. Based on an in-depth analysis of current practices in and resources from the events industry, a total of nine categories of sources of emission activities have been identified that are applicable for events[2].

1. Production and Materials
2. Freight and Logistics
3. Food and Beverage
4. Travel to and from the Destination[3]
5. Local transportation
6. Accommodation
7. Energy
8. Waste
9. Digital Content and Communication

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[2] Note: Some emission sources were either excluded, removed, or not covered based on the consultation among the stakeholders of the initiative. Some of the sources which are either excluded or tabled in this version have been listed in Appendix A. The methodology will continue to update any categories that are deemed material or immaterial in subsequent versions.
[3] Even though these activities are separated in time (pre-event and post-event), they fall into the same activity category since they are referring to the same process that is measured in the same way.

Each of these nine categories has been classified based on the temporal boundary; i.e., pre-event, event, and post-event. However, multiple emission activity categories occur at multiple times throughout the event, leading to the general event boundary below:

Figure 1: Boundary of an Event

Note that the classification system shown above for each of these nine categories under pre-event, event, and post-event may not be representative of all different event types in the industry. Therefore, entities should assess the materiality of each of these categories and their sub-categories defined in the rest of this methodology for their event and accordingly adapt the given classification system for their unique circumstances. This methodology will provide guidance on measurement for all of these categories. However, events should focus on the categories that they have determined as material and report transparently about the categories they have excluded from their measurement and reporting boundaries.

2.3 ALIGNMENT OF EMISSION SOURCES TO NZCE ACTION AREAS

The NZCE initiative had structured the roadmap into five identified Priority Action Areas. These areas provide the focus for collaborative action across the value chain for the industry and are used to segment decarbonisation actions. Emissions measurement benefits from more detailed categories to ensure that all emission sources are captured. The following table outlines how the nine emission categories align with the Priority Action Areas.

Action Area	Alignment to Event Emissions Categories
Action Area 1: Power events efficiently with clean, renewable energy	Energy
Action Area 2: Redesign events to utilise sustainable materials and be waste free	Production and Materials Waste Digital Event and Communication
Action Area 3: Source food sustainably, and eliminate food waste	Food and Beverage
Action Area 4: Move goods and equipment efficiently and transition to zero emissions logistics	Freight and Logistics
Action Area 5: Work with and influence partners in the travel sector to reduce and mitigate the emissions of travel to events	Local Transportation Travel to and from the Destination Accommodation

Table 1: Alignment of Emission Categories to Action Areas

2.4 STAKEHOLDER'S CONTROL AND RESPONSIBILITY ON THE EMISSION SOURCES

While each of the nine categories are important to be quantified in accordance with the principles of GHG accounting, each industry actor and emission source will vary in size and significance. Apportioning emissions across different stakeholders is difficult and time consuming, and data transfer among stakeholders is rarely efficient. Therefore, measurement of the full range of event emissions can be challenging.

The methodology restricts its focus on "how" to quantify event-level emissions. Providing guidance on "who" and "which" stakeholder has control and responsibility on the nine emission categories is beyond the scope of the methodology in its current form. The methodology will refer its readers to the NZCE Roadmap that outlines stakeholder responsibilities and prioritisation for each action area.

To reiterate the roadmap, stakeholder responsibility of a specific emission source does not mean that entity should take responsibility for reducing or offsetting those emissions, but it should ensure that the systems are in place to measure and report the emissions. It is fundamental to effective measurement and emission reductions across all elements of the event that data is shared among stakeholders, and entities should be prepared to share it accordingly.

3 METHODOLOGY APPROACHES AND CONSIDERATIONS

This measurement methodology is structured in the following ways and considers the below approaches when providing guidance for quantifying each of the nine sources of emissions.

3.1 THREE TIERS OF QUANTIFICATION AND PROGRESSION

Though primary data is preferred for measuring emissions, accurately quantifying emissions from each of the nine categories and covering 100% of the boundary with primary data is rarely possible or feasible for events. Therefore, the methodology introduces a three-tier system that enables a starting point for measuring events and addresses each entity's net zero journey from "beginner" to "advanced." This will also enable the industry to work collectively in improving the quantification methodologies over time. Different stakeholders might be able to progress more quickly through the tiers than others and some might already be able to use the advanced tier at the point of publication of this document. In order for the events industry to decarbonise as efficiently as possible, all stakeholders should work actively on progressing to the advanced measurement tier. **Note that the timeline in terms of the years to move from one tier to another will be taken up in the subsequent versions of the methodology and is parked as documented in Appendix A.**

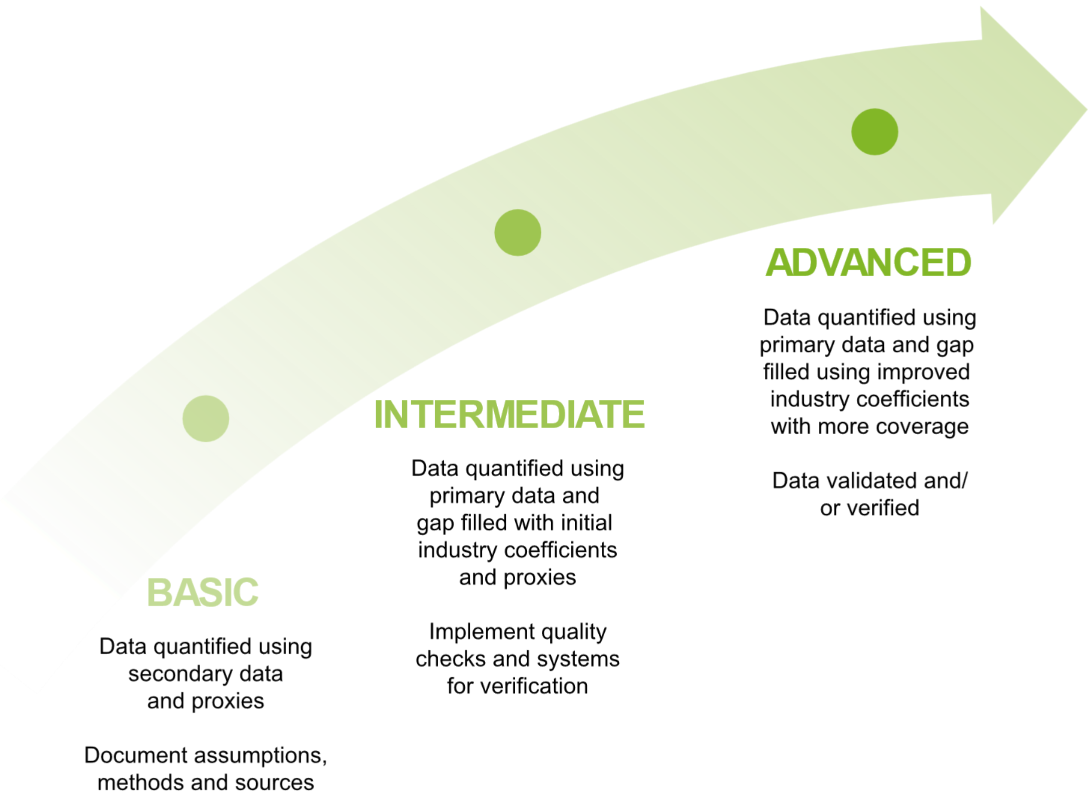
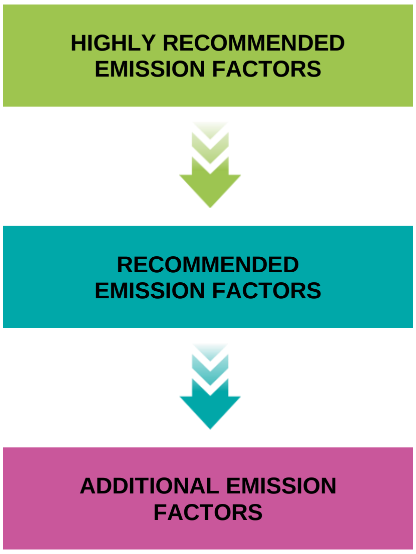


Figure 2: Tiers of Quantification

3.2 HIERARCHY OF SELECTION OF EMISSION FACTORS

Several different sources of emission factors are available online for the same emission sources. In many cases, there are no “right” sources, but consistency and transparency are needed in selecting the emission factors, as well as in reporting emissions later. Choosing the emission factor that is most appropriate is important to quantifying emissions as accurately and representatively as possible. Therefore, the methodology has provided emission factors sources based on the following hierarchy:



Also note that NZCE does not require the above hierarchy for companies that are mandated by their national/local regulation to use a specific national emission factor. Such companies should continue to follow the direction given by the regulatory bodies for compliance and reporting.

3.3 ASSUMPTIONS, COEFFICIENTS, AND PROXY DATA ARE ESSENTIAL

Because primary data for all emission sources will not be available, relying on proxy and secondary data will be essential. Therefore, the methodology provides guidance on how to support the most basic level of measurement and reporting. Please find more information about the status of coefficients in this methodology version in Appendix A. Coefficient and proxy data will be improved over time by the NZCE initiative and updated in future versions of this methodology. Assumptions provided in the different sections of this document are based on data shared by event industry actors and on assumptions made in resources analysed by the measurement workstream. As more data is shared by the events industry, assumptions will be strengthened. **Wherever organisations are able to make more accurate assumptions for their specific context, those assumptions should be given priority.**

3.4 GENERAL PREMISE OF APPORTIONMENT

In general, apportioning is an inherent approach to any carbon calculation methodologies. For example, in the hospitality industry as per the Hotel Carbon Measurement Initiative (HCMI) methodology, multiple hotels that outsource their laundry to the same vendor will apportion the emissions based on their respective laundry tonnage. Similarly, apportioning is very common in the finance industry where, as per the Partnership for Carbon Accounting Financials (PCAF), an attribution factor is determined by an investor to apportion the emissions from its share of investee’s emissions.

In the events industry, if two events take place in parallel in the same venue where energy cannot be measured separately, apportioning becomes critical. Therefore, the methodology incorporates principles of apportionment where necessary and provides basic guidance on how emissions can be apportioned using various methods.

3.5 DOCUMENTATION OF ISSUES AND IMPROVEMENTS

It is recognised that this first version of the measurement methodology will not be able to cover and address all measurement-related issues in the events industry. Therefore, the methodology takes the approach of documenting each issue so that these can be deliberated and vetted within the NZCE workstreams and improvements, and updates can be made in subsequent versions. These issues can be found in Appendix A.

4 MEASURING EVENT EMISSIONS

4.1 PRODUCTION AND MATERIALS

Impact and Measurement Challenges

Depending on the event type, materials and furniture can contribute significantly to event emissions. Exhibitions and congresses have an especially large carbon footprint connected to materials, while corporate events have a much smaller impact in this emission source.

- Research of the carbon emissions of events in France have found that materials and furniture used at an event contribute between 2% (with attendee travel and accommodation emissions included) and 65% (with attendee travel and accommodation emissions excluded) of overall event emissions.[4]

While there may be hundreds of different types of materials that can be used at an event, it is extremely challenging to quantify and report the emissions of every single material and product used for an event. However, based on the analysis of current practices and resources, the main material types found to be commonly used at events and should be measured can be categorised as follows:

- Stand Materials/ Construction Elements
  - Wood: Example - Plywood, MDF, sawn timber (used in structural wall and floor construction).
  - Metal: Example – Welded steel, aluminium (used in modular shell scheme and floor edging).
  - Flooring: Example - Carpet, vinyl, wood.
  - Electricals: Example – Spotlights, lamps, wiring.
  - Decoration: Example - Paint, wallpaper, vinyl wrap.

- Signage Materials
  - Plastics: Example - Adhesive vinyl, PVC Banners, Foamex/Foamcore.
  - Paper & Board: Example - Cardboard, paper, Honeycomb Board.
  - Textiles: Example – Polyester, Cotton Canvas, Nylon.

- Marketing Materials
  - Exhibitor/Attendee ID: Example – Lanyards, badge holders, labels.
  - Printed materials: Example – Catalogues, pocket guides, flyers.
  - Promotional Items: Example – Tote bags, water bottles, mugs.

- Furniture
  - Tables & Chairs: Example – Stools, desks, sofas.
  - Appliances: Example - Refrigerators, coffee machines, water coolers.

- A.V. & I.T. Equipment
  - Audio Visual: Example - Screens, monitors, speakers, and lighting,
  - I.T.: Example - Ticketing machines, Desktop computers, scanners.

A more comprehensive list of materials can be found in the NZCE Materials Library resource which you can find on the NZCE initiative's resources page. Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 2 section of the NZCE Roadmap on p. 25.

[4] Data from more than 200 events held in France (Source: UNIMEV, Cleo Event Performance Calculator, 2020).

What's Being Measured in This Section

Boundary	Inclusion/Exclusion	Comments
Emission source		
Emissions from extraction and production associated with production materials. Also known as embodied carbon.	**Included in this section**	For Exhibitors – Data should be collected on all materials / equipment used in stand production for calculation. Including the weights, volumes or quantities used. For Organisers – Organisers should account for all items and materials directly under their control that are either purchased or leased by them, including carpet, signage, and feature spaces.
Emissions from freight and logistics of transporting/shipping materials to and from event venue	**Included in Freight and Logistics section**	
Emissions from disposal of materials	**Included in Waste section**	

Table 2: Production and Materials - Boundaries

Primary Data to be Collected

Primary data to be collected for materials includes:

1. Materials/Furniture items used
2. Quantity and weights of materials/furniture items used

Formula for Converting Primary Data into Emissions

GHG emissions for each material type = Number of items X Weight of each item (kg) X Emission Factor (CO_2e/kg)

Emission Factors (EFs) Sources:

In addition to the sources highlighted below, the Smart Production and Waste Management Workstream has compiled a list of materials with corresponding information about emission factor sources. Additionally, the Smart Production and Waste Management Guidance Document provides additional context this Materials Library. You can find both of these documents on the NZCE initiative's resources page

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	Circular Economy and University of Bath: Inventory of Carbon and Energy (ICE) Database Version 3.0	Ecoinvent v.3.9.1
Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0		The British Standards Institution (BSI): PAS 2050:2011 methodology

Table 3: Emission Factors Sources Production and Materials

Secondary Data Examples

- Carbon footprint of materials used from a similar event as proxy
- For collecting weight-based data of plastic items, the Plastics Measurement Methodology for Accommodation Providers by the Global Tourism Plastics Initiative (GTPI) can be consulted.

Please refer to the status of the NZCE's industry coefficients work in Appendix A

Measurement Considerations According to Different Tiers

- Basic: Use industry averages, proxies, or other secondary data to determine the emissions associated with event materials used in the production stage of the event. Collect weight/volume/cost of some key materials and determine emissions using relevant emissions factors. Priority should be given to measuring stand and production materials including carpet and signage as these represent the highest impact categories of an event that have a high level of influence (control) and data which should be easily accessible to the stakeholders responsible for using them. Please refer to the NZCE Roadmap pp. 61, 64, and 67 for further guidance on each categories level of impact and influence.
- Intermediate: Move to the intermediate tier by collecting weight/volume/cost of event materials such as banners, signage, stands, etc. and by calculating emissions using relevant emission factors as prescribed above. Also use common industry practices and databases to apportion the emissions to account for any reuses of materials. Use industry coefficients and databases to calculate emissions for any remaining material types.
- Advanced: At the advanced level, gather primary data from suppliers and vendors regarding the embodied carbon of the materials used. Explore life cycle assessment (LCA) methods to account for the entire supply chain impact of the materials. Use improved industry database, coefficients, and practices to apportion and determine the emissions.

Apportionment Considerations

Apportionment of material and furniture emissions may be required if multiple events share materials, furniture, or other items for increased efficiency and cost savings or if an event procures reused, reclaimed, or hired materials, furniture, or other items. To calculate emissions produced by each event's materials, furniture, or other items used, apportioning can be done based on:

- Weight
- Volume
- Cost

For material reuse, the current recommended approach is to divide the emissions based on the amount of planned reuse, for example if an item is planned to be used 5 times, organisations should account for 20% of materials emissions. Further guidance on apportioning of materials such as carpets, rental equipment, furniture, shell scheme, etc. are not included in this version of the methodology based on the fact that amounts of reuse for different materials are currently unknown. This topic will be revisited in subsequent versions after further consultation with the industry. Please refer to the Appendix A for further details on this.

Illustrative Example[5]

An "XYZ Event" used 100m² of carpet at their event. They calculate the estimated emissions from purchased carpet following the steps below:

1. Total carpet area ordered. (Total m²).
2. Find an appropriate emission factor (X $KgCO_2e$ per m²). This will depend on the carpets weight per m², which is affected by the pile depth and backing. Refer to your supplier for this data. Depending on the carpets weight select an emission factor that is closest aligned (nearest in weight). Some carpet manufacturers can supply specific emission factors for their products, however if one is not available, please refer to the NZCE Materials Library to find a suitable emission factor.
3. Calculation:

   (Total area in m²) x (Emission factor - $kgCO_2e$ per m²) = (Total Emissions – X $kgCO_2e$)

   Example: (Based on 320g per m² carpet type)

   100m² x 6.70$kgCO_2e$[6] (per m²) = 670$kgCO_2e$ (0.67 tCO_2e)

Additionally, "XYZ Event" is also using stand builds. They calculate the emissions related to their stands as below. More detailed calculation guidance will be published as part of the next version of the Materials Library:

Material	Amount Used	Emission Factor	Calculated Emissions
Open Panel Timber Frame	100 kg	0.345 $kgCO_2e$	34.5 $kgCO_2e$
MDF	50 kg	0.856 $kgCO_2e$	42.8 $kgCO_2e$
Sawn Timber	50 kg	0.263 $kgCO_2e$	13.15 $kgCO_2e$
Carpet	50 m²	6.70 $kgCO_2e$	335 $kgCO_2e$
Adhesive Vinyl	10 m²	3.1 $kgCO_2e$	31 $kgCO_2e$
Total:			456.45 $kgCO_2e$

[5] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.
[6] Emission factor chosen represents closest match 300g/m²

4.2 FREIGHT AND LOGISTICS

Impact and Measurement Challenges

The impact of the emissions from freight and logistics may vary from location to location as well as by event type. It is found to generally be material for corporate events, and specifically exhibitions and other events with more "built elements" such as trade shows. Below are few examples demonstrating the variation in share of this category to the overall footprint.

- Research on the US and Canada B2B exhibition industry found that on average, 1% of carbon emissions of events are generated by logistics[7] (when attendee travel emissions are included).
- Research of the carbon emissions of events in France have found that logistics and freight contribute between 1% (with attendee travel and accommodation emissions included) and 10% (with attendee travel and accommodation emissions excluded) of overall event emissions.[8]
- The 2021 season of Formula E reported that 71% of its carbon footprint was freight (with attendee travel included)[9].

Measuring emissions from freight and logistics is generally deemed difficult due to the complexity of transport chains, and accessibility of granular and verifiable emission data that is calculated based on common methodologies.

What's Being Measured in this Section

Boundary	Inclusion/Exclusion	Comments
Logistics Activity		
Pre-event: Vehicles used in the transportation and logistics of goods and materials for the event	**Included in this section**	Emissions from fuel usage or distance travelled by onsite logistic vehicles such as forklifts are generally very small but may be included if material. Therefore, materiality should be assessed for such onsite logistics vehicles.
Post-event: Vehicles used in the transportation and logistics of goods and materials after the event	**Included in this section**	
Post-event: Vehicles used in the collection and disposal of waste after the event	**Included in Waste section**	
Emission Source		
Combustion of fuels in the transport of all materials and items used at an event.	**Included in this section**	This transport can happen through multiple different modes, ranging from air and sea to rail

[7] https://www.ufi.org/wp-content/uploads/2022/09/Finding_the_Future-Final_Report.pdf
[8] Data from more than 200 events held in France (Source: UNIMEV, Cleo Event Performance Calculator, 2020).
[9] Formula E (2021). How Formula E Achieves Net Zero. https://www.fiaformulae.com/en/news/3417/how-formula-e-achieves-net-zero#:~:text=It%EF%BF%A2%EF%BE%80%EF%BE%99s%20a%20year%20since%20the,seven%20seasons%20of%20electric%20racing

		and road transport and even include transport by bike.
Upstream or Well-to-tank (WTT) emissions associated with the production and transportation of fuels used in vehicles.	**Included in this section**	

Table 4: Freight and Logistics - Boundaries

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 4 section of the NZCE Roadmap on p. 30.

Primary Data[10]

1. Round-trip distance – Total distance from shipment's origin to venue and back
2. Volume of materials transported
3. Weight of materials transported
4. Vehicle type – air, rail, sea, road
5. Number of trips for transportation
6. Fuel consumption of vehicles

Formulae for converting primary data into emissions

Mobile Combustion[11]

- GHG emissions for each mode of transport = Distance shipment travelled (km) X Weight of shipment (kg) X EF (CO_2e/kg-km)
- GHG emissions for each mode of transport = Distance shipment travelled (km) X EF (CO_2e/km)

Upstream (WTT) Emissions[12]

- GHG emissions for each mode of transport = Distance shipment travelled (km) X Weight of shipment (kg) X Upstream EF (CO_2e/kg-km)
- GHG emissions for each mode of transport = Distance shipment travelled (km) X Upstream EF (CO_2e/km)

Note, if there are multiple consignments or shipments, then as per GLEC framework, it is accurate to calculate kilograms-kilometres separately for each consignment and to then add the individual kilograms-kilometres values rather than adding the total kilograms and kilometres and then multiplying. Please see below as an example:

[10] Not all may be required for final GHG calculations, as it depends on the granularity of emission factor used.
[11] Emissions related to fuels combusted to power vehicles.
[12] Upstream emissions associated with the production and transportation of fuels used in vehicles.

Shipment		A – Kilograms	B – Kilometres – (roundtrip)	C – Kilograms-kilometres A X B
Correct Method				
	1	10	1,000	10,000
	2	40	400	16,000
	3	400	300	120,000
Total				**146,000**

Table 5: Distance Calculations Aligned with the GLEC Framework

Note that if the logistics are via flights, then it is important to consider the non-CO_2 (radiative forcing) effects of aviation. Therefore, please refer to section 4.4 for detailed guidance on radiative forcing.

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	International Civil Aviation Organization (ICAO): Carbon Emissions Calculator	International Energy Agency (IEA): Emissions Factors 2022
Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0	Emission factors provided by the energy/fuel provider, with associated third-party assurance certificate	Clean Cargo: 2020 Global Container Shipping Trade Lane Emissions Factors
Energy Information Administration (EIA) – United States of America: Carbon Dioxide Emissions Coefficients by Fuel		Environmental Protection Agency (EPA) – United States of America: SmartWay Sustainability Accounting and Reporting
Global Logistics Emissions Council Default Fuel Efficiency and CO2e Intensity Factors		
Environmental Protection Agency (EPA) – United States of America: GHG Emission Factors Hub		

Table 6: Emission Factors Sources Freight and Logistics

Secondary Data Examples

- Average freight emissions during an event using a global default or proxy (ex: $kgCO_2e$ per event)
- Average freight emissions during a similar event from the organisation, destination, or other event type

- Spend – Average freight emissions using amount of spend on transport with a spend-based coefficient (ex: $kgCO_2e$/Euro spent on freight)

Measurement Considerations According to Different Tiers

- Basic: Use secondary data (including spend) and proxy values to estimate emissions related to event logistics and transportation. Utilise industry averages for transportation distances and modes. Alternatively make assumptions on number of trucks or average trips and distance to estimate emissions. Also share the assumptions with the industry for aligning the approach and future improvements.

- Intermediate: Start collecting primary data from logistic partners, carriers, and suppliers to get actual distance, fuel consumption, or transportation data. Use initial industry coefficients and assumptions to estimate.

- Advanced: For advanced quantification, use primary data to determine emissions and involve logistics partners and 3rd party organisations to validate and verify the approach. Use improved industry coefficients to estimate any gaps. Also include emissions from upstream (WTT) usage of vehicle fuels.

Apportionment Considerations[13]

Apportionment of freight load may be required if multiple events share their load space in the same truck for increased efficiency and cost savings. To calculate emissions produced by each event's load within the same truck, apportioning can may be done based on either of the approaches:

- Weight
- Volume
- Cost

Ex: Two events share load in same truck. Total load weight 1000 kgs, total cost of shipment is 1000 Euros and total emissions generated were 100 $kgCO_2e$.

Apportionment based on	Event 1	Event 2
Total share of weight Weight allocation Emission allocation	80% 800 kgs 80 $kgCO_2e$	20% 200 kgs 20 $kgCO_2e$
Total share of volume Weight allocation Emission allocation	80% 800 m^3 80 $kgCO_2e$	20% 200 m^3 20 $kgCO_2e$
Total share of cost Cost allocation Emission allocation	55% 550 Euros 55 $kgCO_2e$	45% 450 Euros $kgCO_2e$

Table 7: Freight and Logistics Apportionment

[13] The considerations given are for reference and to show the approach of apportioning based on different options available.

Illustrative Example[14]

Logistics for an "XYZ Event" involved five shipments: two by air (total distance of 6,000 km and total weight of 30,000 kgs) and three by road (data unknown).

The event organiser calculated the total emission from the five shipments as follows:

Air:		**Road:**
Air shipment 1: Distance: 4,000 km Weight: 15,000 kgs Kg-km: 60,000,000 kg-km	**Air shipment 2** Distance: 2,000 km Weight: 15,000 km Kg-km: 30,000,000 kg-km	Because the data for the shipment by road was not known, the organiser used a proxy for emissions from road shipment from a similar event which was around **10,000 tCO_2e.**
Total Kg-km: 60,000 + 30,000 = 90,000,000 kg-km **Emission Factor as determined:** 0.15 $kgCO_2e$ per kg-km. **Total emissions (tCO2e):** (90,000,000 X 0.15)/1000 = **13,500 tCO_2e**		**Total logistic emissions for "XYZ Event"** **=** Emissions from air shipment + Emissions from road shipment = 13,500 + 10,000 = **23,500 tCO_2e.**

[14] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

4.3 FOOD AND BEVERAGE

Impact and Measurement Challenges

Depending on the event type, Food & Beverage (F&B) contributes significantly to event emissions. Especially events centred around food, such as food shows, have a large carbon footprint connected to F&B, while events with little to no F&B and no catered meals logically have a limited impact on this emission source category.

- Research of the carbon emissions of events in France have found F&B used at an event contribute between 5% (with attendee travel and accommodation emissions included) and 75% (with attendee travel and accommodation emissions excluded) of overall event emissions.[15]

Measurement of F&B emissions at events is complex for multiple reasons.

1. Emissions of food items vary greatly depending on many factors, including the location of production (i.e., feed sources for livestock and practices regarding soil health, a critical factor for emission absorption during crop cultivation, will differ greatly between regions), the location of processing, as well as the location of consumption and the distance between these locations. Additional impacts are made by the packaging of food and beverage items, as well as the preparation of meals.

2. Emission factors are mostly provided for individual food or beverage items and ingredients instead of for meals. Additionally, while most emission factors are provided by weight, information about the weight of each ingredient used in a recipe can be especially complex to obtain from stakeholders that are not involved in preparing the foods.

3. Emission factor sources are limited and often work with different measurement variables. Accordingly, some measure emissions per calories, some per weight, and some per volume. Additionally, the quality of information about food emission sources has only begun to increase over the last few years. This creates complexity for comparing different sources, especially because many sources don’t transparently report on their methodologies, and for creating cohesion in ultimate measurement outcomes.

4. Specifically for the events context, working with proxies is highly complex because types of meals and beverages can differ greatly between each event and even between the various meals and beverages served at one event. Meals can range from breakfast to snacks, to buffets, to multiple course sit-down meals, to lunch boxes. Beverages served can be simple single-ingredient drinks, such as water or juices, or they can include complex cocktail or coffee mixtures. The ingredients included in these meals and beverages can then differ even more depending on the regional context and local food customs or on the group of event attendees.

For better understanding of the following section, a differentiation needs to be made between these terms: meal, food or beverage item, and ingredient. Meals in this methodology will refer to dishes served at an event. These meals represent the combination of multiple food and beverage items and ingredients. Items refer to any food or beverage that can be consumed as is. As such, it can include items like bread (which include other ingredients, such as flour, yeast, and water) or items like carrots (which itself is also an ingredient). Ingredients refer to food or beverages that can be used to create food or beverage items or meals, such as eggs and flour, but also vegetables or fruits.

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[15] Data from more than 200 events held in France (Source: UNIMEV, Cleo Event Performance Calculator, 2020).

What's Being Measured in this Section

Boundary	Inclusion/Exclusion	Comments
F&B Activity		
F&B catering directly organised or purchased for the event by the organiser or exhibitor	**Included in this section**	
Lunch/Dinner/Cocktail organised post-event (or outside of event duration) for VIP guests etc	**Included in this section**	
F&B purchased by attendees on their own at venue cafes, food trucks or vending machines	**Excluded**	Excluded as per Appendix A
Emission Source		
Upstream emissions from extraction, production and transportation involved with F&B items before it reaches the event or end consumer (embodied carbon)	**Included in this section**	
Emissions from freight and logistics of transporting/ shipping F&B items to event venue	**Included in Freight and Logistics section**	
Emissions from disposal of food waste	**Included in Waste section**	

Table 8: Food and Beverage - Boundaries

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 3 section of the NZCE Roadmap on p. 28.

Primary Data to be Collected

As mentioned above, most emission factor sources connected to F&B are provided for individual items and ingredients. Wherever available, this methodology encourages the use of item-level emission factors because this strikes an acceptable balance of detail. Wherever ingredients are known, ingredient-level data should be used. The most reliable data of food and beverage use for an event can be provided by the catering provider that is directly involved in the choice and procurement of ingredients. In line with this, the best primary data to be collected for F&B emission calculations is the amount (in weight and sometimes volume) of different items and ingredients purchased for the event.

If this data is not accessible yet, limited assumptions can be made based on proxies for meals and beverages and related spend and overall F&B weight data.

Formulae for Converting Primary Data into Emissions

When information about the weight of each food and beverage item or ingredient category used for the preparation of meals and drinks served at an event is available, the standard formula for calculating GHG emissions from food and beverages is:

- GHG emissions = Number of food or beverage items or ingredients served X Weight or volume of food or beverage item and ingredient (kg/l) X EF (CO_2e/food or beverage type) or
- GHG emissions = Total weight or volume of food and beverage item or ingredient (kg/l) X EF (CO_2e/food or beverage item).

These formulae are the most accurate way of calculating F&B emissions. However, because of the complexities described above, there are many ways to measure emissions of food and beverages depending on which primary data you start out with. The decision tree below describes the relevant steps to arrive at reliable emissions data.

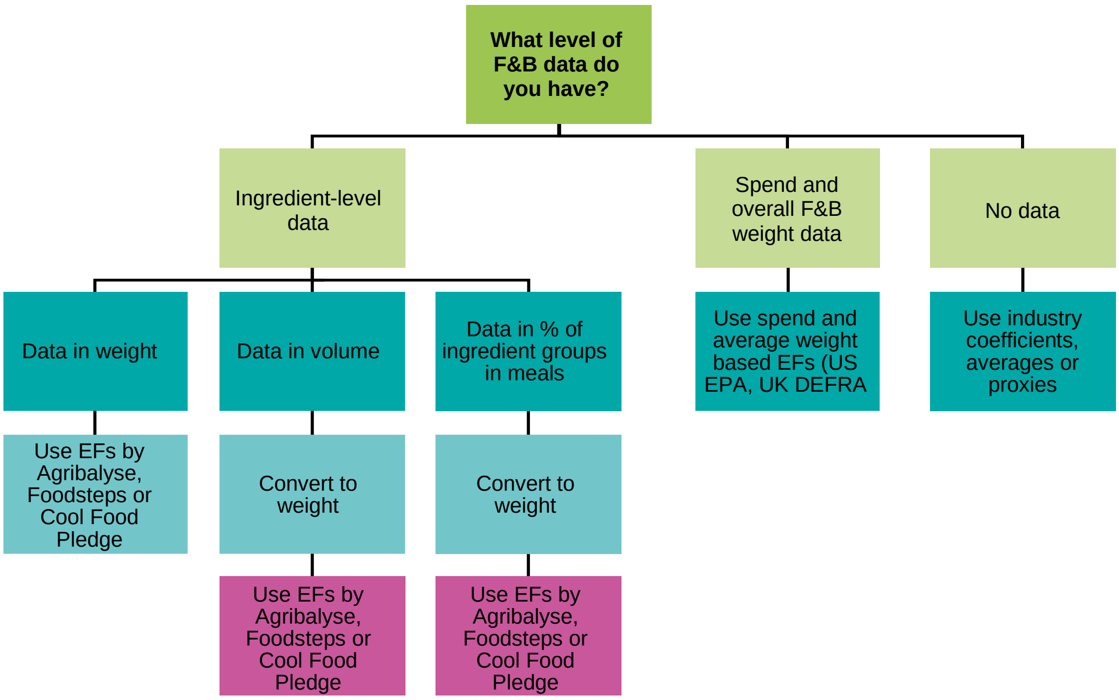

Figure 3: Food and Beverage Measurement Decision Tree

These calculations do not include the emissions created by cooking but do provide as much information about the upstream emissions of food as possible. Cooking emissions should generally be covered by other emission source categories (e.g., venue energy) or accounted for in companywide reporting from the catering provider.

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Agribalyse - France: 3.1.1	Temasek - Singapore: Environmental Impact of Key Food Items in Singapore	Ecoinvent v.3.9.1
Foodsteps – United Kingdom: The Food Footprint 100 report		Environmental Protection Agency (EPA) – United States of America: Supply Chain Greenhouse Gas Emission Factors v1.2 by NAICS-6
The Cool Food Pledge Calculator		Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022

Table 9: Emission Factors Sources Food and Beverage

Many of the current carbon calculators available base their food calculations on the 2018 IOC Carbon Footprint Methodology for The Olympic Games: food-related proxies. However, the resource itself states that its data quality is quite low, and that improvement of data quality will be one of the focus areas of future publications, which have not been made available yet. Accordingly, this methodology recommends the use of newer methodologies/ emission factor sources with higher data quality and transparency as listed in the highly recommended emission factors sources above.

Secondary Data Examples

Based on the fact that event meals and beverage options are so diverse, this methodology version does not provide coefficients for different meal or beverage types. This issue will be taken up again in future versions of this document.

Measurement Considerations According to Different Tiers

- Basic: Use spend based data or data based on overall F&B weight (e.g., DEFRA, EPA) to estimate emissions related to food & beverage (F&B).
- Intermediate: Start collecting primary data from catering partners to be able to use ingredient-based emission factors. Use proxy values when ingredient-based measurement is not possible.
- Advanced: Measure F&B emissions based on ingredient-based emission factors.

Illustrative Example

An “XYZ Event” caters 100 burrito bowls with a snack for lunch. 70 of those meals are beef-based; 30 are vegetarian. They also serve 30 litres of beer as a drink option.

The event organiser calculated the total emission of F&B served at the event as follows:

Beef-based meals:	**Vegetarian meals:**	**Beer:**
Food items/ingredients:		**Weight of beer:**
Beef, Cheese, Rice, Bell peppers, Apple	Beans, Cheese, Rice, Bell Peppers, Apple	1kg/l
Weight of ingredients:		**Total weight of beer served:**
Beef: 50g Cheese: 100g Rice: 60g Bell peppers: 140g Apple: 80g	Beans: 50g Cheese: 100g Rice: 60g Bell peppers: 140g Apple: 80g	30 kg
Emission Factor as determined:		
Beef: 0.03903 $kgCO_2e/g$ Cheese: 0.01107 $kgCO_2e/g$ Rice: 0.00367 $kgCO_2e/g$ Bell peppers: 0.00138 $kgCO_2e/g$ Apple: 0.00038 $kgCO_2e/g$	Beans: 0.00147 $kgCO_2e/g$ Cheese: 0.01107 $kgCO_2e/g$ Rice: 0.00367 $kgCO_2e/g$ Bell peppers: 0.00138 $kgCO_2e/g$ Apple: 0.00038 $kgCO_2e/g$	1 $kgCO_2e/kg$
Total emissions per meal ($kgCO_2e$):		
(50 X 0.03903 + 100 X 0.01107 + 60 X 0.00367 + 140 X 0.00138 + 80 X 0.00038) = **3.5023 $kgCO_2e$**	(50 X 0.00147 + 100 X 0.01107 + 60 X 0.00367 + 140 X 0.00138 + 80 X 0.00038) = **1.6243 $kgCO_2e$**	
Total Beef-based meal emissions	**Total vegetarian meal emissions:**	**Total beer emissions:**
3.5023 X 70 = **245.161 $kgCO_2e$**	1.6243 X 30 = **48.729 $kgCO_2e$**	**30 $kgCO_2e$**

The total F&B emissions for “XYZ Event” = Emissions from beef-based meals + Emissions from vegetarian meals + Emissions from beer = 245.161 + 48.729 + 30 = **323.89 $kgCO_2e$.**

4.4 TRAVEL TO AND FROM THE DESTINATION

Impact and Measurement Challenges

The emissions generated by the travel of attendees to events are significant and in almost all cases the largest contributor to an event's carbon footprint. It is observed that travel accounts for about 70-90% of the carbon emissions from an average event.

While in some cases (in-house events for instance) the exercise is easy, there are several challenges in quantifying the emissions from attendees' travel to and from the destination. The key ones are:

- Incomplete or unknown information about attendees' origins, modes of transports and total travel distance to and from the event.
- Attendee types are diverse (exhibitor, staff, vendor, visitor, VIP, etc.) and they usually originate from numerous locations making it challenging to capture all travel patterns.
- The dynamic nature of travel itineraries and routes complicate the quantification and apportioning to event.
- Limited influence or control by the organisers.

What's Being Measured in this Section

Boundary	Inclusion/Exclusion	Comments
Mode of transport		
Air transport	**Included in this section**	
Land transport	**Included in this section**	
Sea/ocean transport	**Included in this section**	
Emission Source		
Combustion of fuels used to power the vehicles and conveyance (mobile combustion)	**Included in this section**	
Upstream or Well-to-tank (WTT) emissions associated with the production and transportation of fuels used in vehicles.	**Included in this section**	
Attendee Type		
Attendee origin city different than the venue city	**Included in this section**	In this case, the attendee would be 'Non-local' or 'Traveller' attendee
Attendee origin city same as the venue city	**Included in this section**	In this case, the attendee would be a 'Local' attendee

Table 10: Travel to and from the Destination - Boundaries

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 5 section of the NZCE Roadmap on p. 33.

Primary Data to be Collected

- Distance travelled
- Mode of transport (bus, rail, taxi, plane, etc.)
- Number of passengers
- Others as applicable[16]
  - Flight duration
  - Travel class

Assumptions to Use in the Absence of Data[17]

- Normally, the attendee's origin city/country information and mode of transport may be derived from event registration forms in order to estimate the one-way distance travelled to the event venue and the mode of transport used.
- Assume all attendees travel round trip (two times the one-way distance) unless documented otherwise.
- For air transport, where the attendee's travel class is not known, assume that 80% travel in economy class while 20% travel in business class.
- For assumptions based on available or unavailable data, please refer to the below figure.

[16] Mostly required for flight emissions.
[17] Note that the assumptions provided are based on anecdotal information taken from industry research. The assumptions are only for estimation and can be considered as a starting point when no data is available. Users can adjust these assumptions and are free to use their own based on their knowledge of the industry and event. To increase the accuracy of these assumptions, the methodology would recommend companies to consider conducting attendee surveys or sharing data from previous events to fine-tune the assumptions for their specific audience, event characteristics and geographical variations.

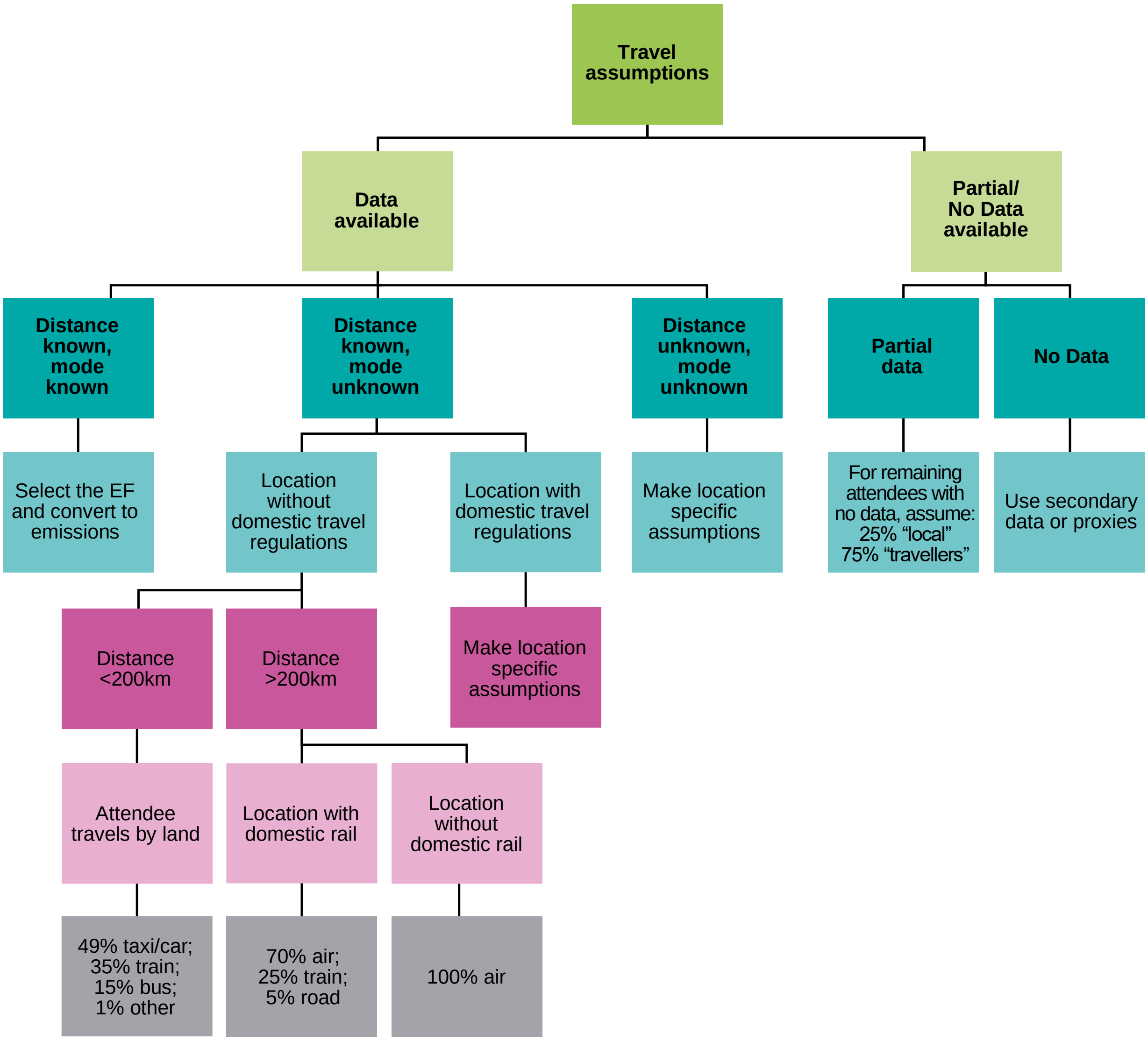

Figure 4: Travel (to and from the Destination) Assumptions

Formula for Converting Primary Data into Emissions

Mobile combustion

- GHG emissions = Distance travelled (km) X EF (kgCO_2e/km)
- GHG emissions = Distance travelled (km) X no. of passengers X EF (kgCO_2e/passenger.km)

Upstream emissions (or well-to-tank emissions)

- GHG emissions = Distance travelled (km) X Upstream EF (kgCO_2e/km)
- GHG emissions = Distance travelled (km) X no. of passengers X Upstream EF (kgCO_2e/passenger.km)

Accounting for non-CO_2 (radiative forcing or RF) effects of aviation:

While CO_2 emissions from aviation remain the most commonly cited source of emissions, the non-CO_2 effects of emissions from aviation are believed to cause further warming to the order of two to four times of CO_2 emissions. Because travel is one of the largest sources of emissions for the events industry, the methodology clearly recognises the importance of accounting for these non-CO_2 factors to calculate the full climate impact. However, based on extensive research *the methodology strongly recommends but does not mandate* organisations in this version to account for radiative forcing for the following reasons:

- The scientific evidence, although strengthening, still remains nascent and therefore, too uncertain to accurately account for the impact of non-CO_2 effects on climate.
- Based on research, no other globally accepted methodologies on aviation and travel (such as GHG Protocol, SBTi Aviation Sector Guidance, GLEC Framework, IATA, ICAO, Carbon Neutral Protocol, US EPA, WEF SAF Methodology) has mandated the inclusion of radiative forcing. All of the above methodologies have acknowledged the importance of radiative forcing and are currently reviewing its inclusion based on scientific outcomes.
- Currently only the UK's DEFRA and France's ADEME have provided radiative forcing factors and although many participants in those markets and beyond are choosing to include radiative forcing in their reporting, they are not required to by regulation.
- The radiative forcing multiplier varies globally from 1.9 to 4 which makes it difficult to select the appropriate factor.

Nonetheless, the methodology recognises the importance of radiative forcing to deliver the NZCE pledge and progress towards net zero goals, and therefore the methodology:

- **Requires all** companies to transparently disclose whether radiative forcing, which may further contribute to their footprint, is included or excluded in their calculations and figures.
- If excluded, **requires all** companies to disclose the rationale for not including radiative forcing.
- If included, **requires all** companies to disclose the factor applied and the source used.
- **Requires all** companies to state whether the company commits/plans to publicly report on radiative forcing in the future.

In addition, the methodology would like to make a note that companies that do not include radiative forcing now may have to recalculate and re-baseline their targets in the future, which may result in doubling their footprint.

To include radiative forcing factor in calculations, please refer to the below guidance for two scenarios:

1. If RF is included in the emission factor source – Sources such as UK DEFRA and ADEME already have included the RF as part of their emission factors provided. Therefore, in such cases, please select the appropriate emission with RF and use the equations provided in the section "Formulas for Converting Primary Data into Emissions."

2. If RF is not included in the emission factor source – In such cases, an RF multiplier should be applied to only the CO2 emission factor. Please see Appendix E for more guidance on this.

Emission Factor Sources

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	International Civil Aviation Organization (ICAO): Carbon Emissions Calculator	International Energy Agency (IEA): Emissions Factors 2022
Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0	Emission factors provided by the transportation provider, with associated third-party assurance certificate	
Energy Information Administration (EIA) – United States of America: Carbon Dioxide Emissions Coefficients by Fuel	Other national level sources for transport emissions	
Environmental Protection Agency (EPA) – United States of America: GHG Emission Factors Hub		
International Air Transport Association (IATA): CO2 Connect Calculator[18]		

Table 11: Emission Factor Sources Travel (to and from the Destination)

Secondary Data Examples

- Carbon footprint of travel from a similar event as proxy
- Number of "local" vs. traveller" attendees from a similar event as proxy
- Average distance travelled by attendees by land and air from similar events in similar locations
- Industry coefficients on average carbon intensity per attendee

Measurement Requirements According to Different Tiers

- Basic: Analyse all potential information that can be deduced from the attendee registration forms to make assumptions about average distances and mode. Proxies from similar event profiles may also be searched and used to estimate the footprint from travel.
- Intermediate: Gather more reliable primary data from registration forms on attendee travel distances, modes, and origins. Industry coefficients may also be used to understand average emissions from attendee travel, based on a similar event profile. Rely on implementing digital platforms to register and capture source data directly on attendees travel information.
- Advanced: Calculate emissions using primary data and use improved industry coefficients with more coverage to fill the gaps. Include emissions from upstream (WTT) usage of vehicle fuels.

[18] The current free version of the IATA tool has various challenges when working at scale for footprinting several events and attendees. IATA is launching a new tool called Corporate Travel Package which is an Excel-based data delivery method for corporate users which enables bulk upload and footprinting of several thousand entries.

Apportionment Considerations

Multiple Events in the Same Destination: For example, if the same attendee travels to the destination to attend two different events, then the emissions of the attendee's travel may need to be apportioned based on an appropriate metric for example number of days/hours events attended. However, this is not practically easy to know and account for, and therefore double counting is likely to occur for the two events.

Illustrative Example[19]

An association of boutique shop owners "ABC Association" in France had organised a meeting for its 100 members at a hotel in Paris. One representative from each member attended the meeting from various cities of France. The company wants to calculate the round-trip emissions from their members' travel. Please see the approach below. Note that the emission figures are for reference and conversion steps from activity data to emissions has not been provided and were assumed.

Out of the total 100 members:

1. 50 members' distance and mode were known. Therefore, the emissions were determined using the appropriate emission factor. **Emissions = 300 tCO_2e**

2. Out of the remaining 50, 20 members travelled from cities such as Bordeaux, Lyon, and Nantes where short-haul flights to Paris are banned. Therefore, for the 20 members, it was assumed that they travelled by train. Based on this, "emission factor for train" was selected to convert to get their emissions. **Emissions = 150 tCO_2e**

3. Out of the remaining 30, 10 members were "local" in Paris and their distances and mode were known. Therefore, the emissions were easily determined using appropriate emission factors. **Emissions = 30 tCO_2e**

4. Then for the remaining 20, no data or information about distance and origin was available at all. Based on the assumptions provided for "partial data" in Figure 5, it was assumed that 5 members (25%) were "locals" and 15 (75%) were "travellers."

5. From step 5 above, the average per attendee "local" emissions based on available data were = 30 tCO_2e/10 members = 3 tCO_2e/member.

6. So, for the 5 remaining "local" members the emissions were 3 tCO_2e X 5 = **15 tCO_2e**

7. For the remaining 15 "traveller" members, the average per attendee emissions from step 2 and 1 can be deduced:
   - (150 tCO_2e + 300 tCO_2e) / (50 members + 20 members) = 450 tCO_2e/70 members = 6.4 tCO_2e/member
   - Emissions for 15 "traveller" members = 15 X 6.4 tCO2e = **96 tCO_2e**

8. Total emissions from travel of 100 members = 300 + 150 + 30 + 15 + 96 = **591 tCO_2e.**

[19] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

4.5 LOCAL TRANSPORTATION

Impact and Measurement Challenges

While the significance of the impact of emissions from local transportation is not formally recorded globally and may be less material, it may be important for local events or events hosted in large cities with limited public transport options.

While in some cases (in-house events for instance) the exercise is easy, there are several challenges in quantifying the emissions from attendees' local transportation. The key ones are:

- Incomplete or unknown information on attendees' accommodation within the destination.
- Attendee types are diverse (exhibitor, staff, vendor, visitor, VIP, etc.), they can stay in numerous locations, and can use various modes of transport to attend the event, making it challenging to capture all travel patterns.
- Limited influence or control by the organisers.

What's Being Measured in this Section

Boundary	Inclusion/Exclusion	Comments
Mode of transport		
Land transport	**Included in this section**	
Emission Source		
Combustion of fuels used to power the vehicles and conveyance (mobile combustion)	**Included in this section**	
Upstream or Well-to-tank (WTT) emissions associated with the production and transportation of fuels used in vehicles.	**Included in this section**	
Transportation Activity		
Local transportation to travel between venue and hotel and/or venue and airport or railway station	**Included in this section**	When traveling between hotel and venue, assume no stopovers or detours as documented in Appendix A.

Table 12: Local transportation - Boundaries

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 5 section of the NZCE Roadmap on p. 33.

Primary Data to be Collected

- Distance travelled
- Fuel used[20]
- Mode of transport (bus, rail, taxi, etc.)

[20] For event-owned or managed vehicles/fleet.

- Number of passengers
- Type of transport[21] (small car, SUV, luxury, etc.)

Assumptions to Use in the Absence of Data[22]

- Information on the attendees' hotel/accommodation addresses, length of stay and modes of transport used to travel to the venue may be derived from event registration forms or other methods to estimate the two-way distance travelled to the event venue and the mode of transport used.
- If the attendee's length of hotel stay is equivalent to the number of days of the event, then assume that the attendee attended the event for the entire course of the event and therefore multiply the two-way distance with the number of days of event.
- If the length of hotel stay or number of days of event attendance is not available, then assume attendance as below based on event type:
  - Exhibition – 1 day for a visitor
  - Incentive or Meeting – Entire length of event
  - Other – assume based on common industry practice.
- Assume all attendees attend the event only once in a single day.
- Use a carpooling factor of 1.5 if carpooling data is not available.
- For travel from the airport/railway station to the hotel and back, please assume a distance based on the city/region
- If there is no hotel information available for the attendees' stays, then base calculations on industry data and research, assume that on average attendees travel 25 km round-trip distance of each attendee to/from hotel and venue.
- For assumptions on the mode of local transport, follow the split given in the figure below as appropriate.

Where no information is available or assumptions cannot be made at all, use secondary sources as recommended below.

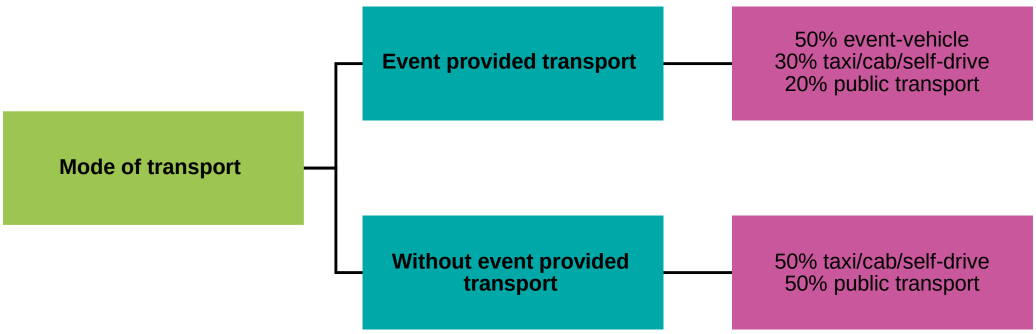

Figure 5: Local transportation Assumptions for Mode of Transport

[21] Depending on the requirement of the emission factor source.
[22] Note that the assumptions provided are based on anecdotal information taken from industry research. The assumptions are only for estimation and can be considered as a starting point when no data is available. Users can adjust these assumptions and are free to use their own based on their knowledge of the industry and event. To increase the accuracy of these assumptions, the methodology would recommend companies to consider conducting attendee surveys or sharing data from previous events to fine-tune the assumptions for their specific audience, event characteristics and geographical variations.

Formula for Converting Primary Data into Emissions

Mobile Combustion

- GHG emissions = Distance travelled (km) X EF (CO_2e/km)
- GHG emissions = Distance travelled (km) X no. of passengers X EF (CO_2e/passenger.km)
- GHG emissions = Mobile fuel consumed (kg) X EF (CO_2e/kg)

Upstream Emissions

- GHG emissions = Distance travelled (km) X Upstream EF (CO_2e/km)
- GHG emissions = Distance travelled (km) X no. of passengers X Upstream EF (CO_2e/passenger.km)
- GHG emissions = Mobile fuel consumed (kg) X Upstream EF (CO_2e/kg)

Emission Factors Sources

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	Emission factors provided by the transportation provider, with associated third-party assurance certificate	International Energy Agency (IEA): Emissions Factors 2022
Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0	Other national level sources for transport emissions	
Energy Information Administration (EIA) – United States of America: Carbon Dioxide Emissions Coefficients by Fuel		
Environmental Protection Agency (EPA) – United States of America: GHG Emission Factors Hub		

Table 13: Emission Factors Sources Local transportation

Secondary Data Examples

- Carbon footprint of local transportation from a similar event as proxy
- Average distance travelled by attendees within the destination from their hotels for similar events in similar locations.
- Industry coefficients for average carbon intensity per attendee

Measurement Requirements According to Different Tiers

- Basic: All vehicle fleets that were involved in transporting attendees and were directly owned/controlled/operated by event entities should be estimated using primary data on fuel usage, distance travelled, number of trips, etc., and emissions should be quantified. For other attendees travelling without event-provided transport, estimates using proxies or any secondary data may be used.

- Intermediate: Gather more reliable primary data using various systems on the attendees' stays within the destination so as to estimate average travel distances, mode, number of trips, etc., and fill the gaps with industry coefficients. Industry coefficients may also be used to understand average emissions from attendee local transportation, based on a similar event profile.

- Advanced: Use primary data from information provided on the attendees' stays within the destination to estimate emissions and fill the gaps with better industry coefficients with more coverage. Include emissions from upstream (WTT) usage of vehicle fuels.

Apportionment Considerations

Multiple Events in the Same Destination: For example, if the same attendee, local transportation to attend two different events, then the emissions of the attendee's travel may need to be apportioned based on an appropriate metric for example based on number of days/hours events attended. However, this is not practically easy to know and account for, and therefore double counting may occur between the two events.

Illustrative Example[23]

Continuing the same example above in section 4.4 of "ABC association," the company would also like to measure the emissions from the members' local transportation from their accommodation to the venue and back.

Airport and Railway Station to and from the Accommodation

- From the total 85 attendees that need hotels to stay, 20 members travelled via train and 65 members via flight.

- Out of the 20 members via train, 10 stayed at the same venue hotel, while the remaining 10 stayed at 3 other hotels.

- Out of the 65 members via flight, 15 stayed at the same venue hotel while the remaining 50 stayed at 3 other hotels.

Airport to and from Hotel

i. The average two-way distance of the two Paris airports (CDG and ORY) from the venue of the 15 members was calculated.
ii. The average two-way distance of the two Paris airports (CDG and ORY) from the other 3 hotels of the 50 members was calculated.

Railway to and from Hotel

i. The two-way distance of the train station from the venue of 10 members was calculated.
ii. The two-way distance of the train station from other 3 hotels of 10 members was calculated.

The total emissions as a result that came out of the above four scenarios were **10 tCO_2e.**

Hotel to and from the Venue

- Out of the 85 members, 25 members stayed in the same hotel as the venue and therefore they did not have any travel associated with their hotel to and from the venue of the meeting. Therefore, emissions were **0 tCO_2e.**

[23] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

- As for the remaining 60 members, they were equally accommodated in 3 different hotels near the venue:

Hotel 1	Hotel 2	Hotel 3
20 members	20 members	20 members
2-way distance from venue – 20 km	2-way distance from venue – 30 km	2-way distance from venue – 40 km
Because the event did not provide transport, as per the schematic, the split for the mode to be assumed is 50% taxi/cab and 50% metro/bus. As per the event organiser, the 3 hotels were intentionally selected as they offered very convenient reach by metro and therefore it was assumed that the bus was not used. So, in this case we assume as follows:		
10 – taxi/cab 10 – train	10 – taxi/cab 10 – train	10 – taxi/cab 10 – train
Because 10 members in each hotel are traveling by taxi/cab a carpooling factor of 1.5 is used as mentioned above in the assumptions. Therefore 10 / 1.5 = 6.66 (round up to 7).		
7 – taxi/cab 10 – train	7 – taxi/cab 10 - train	7 – taxi/cab 10 – train
Based on distance and mode, appropriate emission factors are selected and converted to emissions.		
15 tCO_2e	30 tCO_2e	60 tCO_2e
Total emissions = **105 tCO_2e**		

Table 14: Local transportation Example

The final emissions for all local transportation for the 85 members = 10 + 0 + 105 = **115 tCO_2e**

4.6 ACCOMMODATION

Impact and Measurement Challenges

Emissions from hotel stays of event participants may vary depending on the size and nature of the event. However, it has been found through several studies and surveys that emissions from accommodations are generally a significant contributor to overall event emissions. One example is the latest FIFA 2022 Greenhouse Gas report, where accommodation emissions accounted for almost 20% of the total event emissions[24]. Quantifying emissions from accommodations of the attendees are challenging due to:

- Limited information on if attendees are "locals" or "travellers" and their type of accommodations
- Difficulty in obtaining data from hotels for all the guests and for all different hotels
- Limited control over attendees' choices of accommodations by the organiser

Therefore, this methodology aims to build on the existing hotel industry's methodologies and initiatives such as the HCMI, the Cornell Hotel Sustainability Benchmarking Index (CHSB) and the Hotel Footprinting Tool (HFT) to quantify emissions from attendees' stays during events.

What's Being Measured in this Section

Boundary	Inclusion/Exclusion	Comments
Emission Source		
Emissions from hotel's energy use as a result of attendee's stay (Scope 1 and 2 of hotel)	**Included in this section**	This is already included in the HCMI figure provided by hotels to event partners
Emissions from hotel's outsourced laundry (Scope 3 of hotel)	**Included in this section**	This is already included in the HCMI figure provided by hotels to event partners
Emissions from all other scope 3 categories of hotel such as hotel's business travel, employee commute, purchased goods and services etc.	**Excluded**	Excluded as per Appendix A

Table 15: Accommodation - Boundaries

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 5 section of the NZCE Roadmap on p. 33.

[24] https://iifiir.org/en/fridoc/greenhouse-gas-accounting-report-fifa-world-cup-2022-lt-sup-gt-tm-lt-sup-gt-lt-br-146104

Primary data to be collected

- The HCMI emissions figure of the associated rooms nights from the event, directly calculated by the hotel for the room blocks
- Total room nights
  Please refer to the below decision tree on data collection for measuring accommodation emissions:

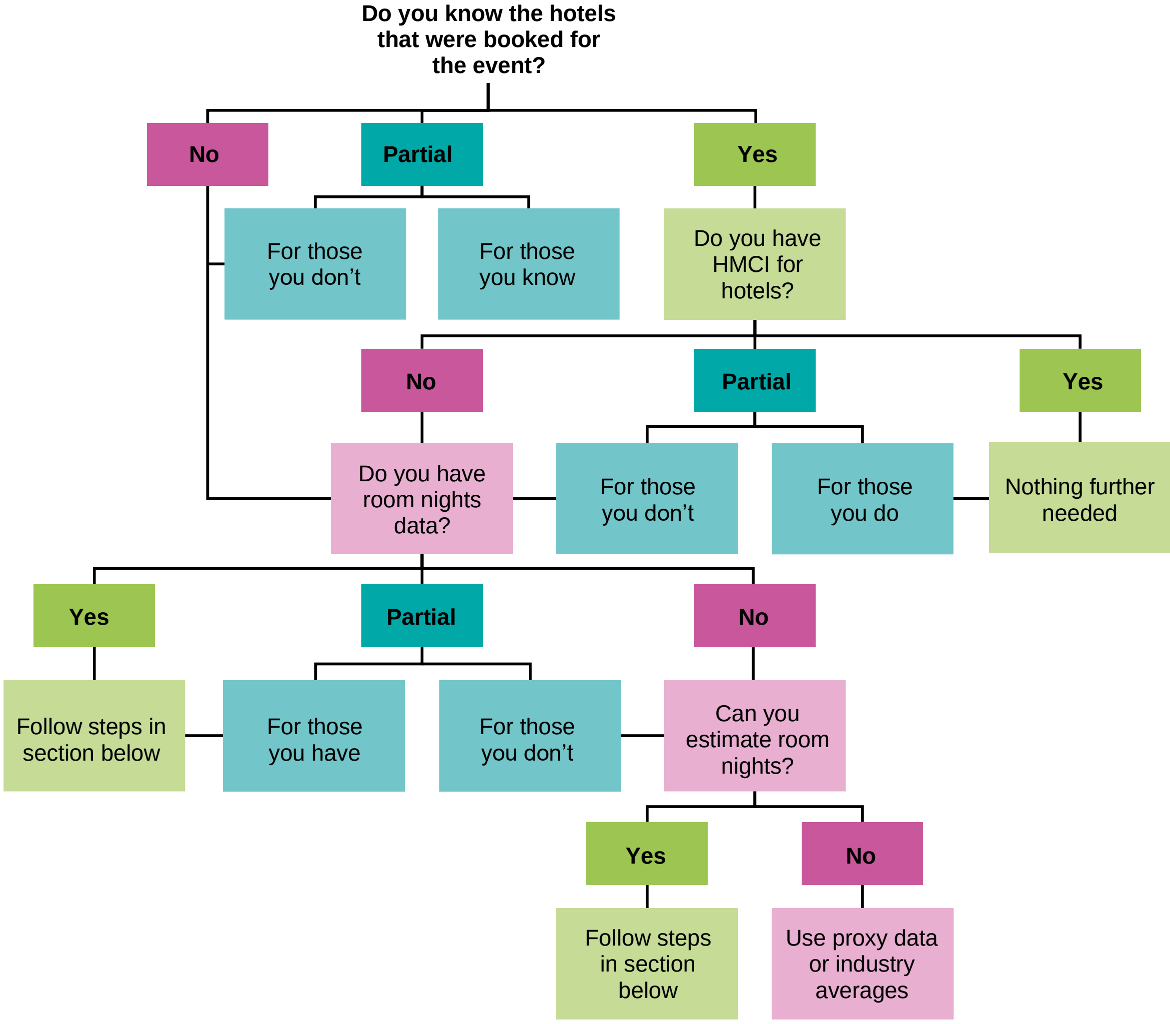

Figure 6: Accommodation Measurement Decision Tree

Assumptions for Room Nights

If the length of hotel stays or number of days of event attendance is not available, then assume attendance as below based on the event type:

- Exhibition – 1 day for a visitor
- Incentive or Meeting – Entire length of event
- Other – assume based on common industry practice

Approach for Converting Room Nights into Emissions

1. Determine room nights of each room that was occupied[25]. See example below to refer to how room-nights are calculated:

For example, suppose a group of 8 attendees booked 5 rooms at a hotel for a conference. The bookings are as follows:	To calculate the total room-nights for this booking, first determine the number of nights each room was occupied:
Room 1: Occupied by Attendee A for 3 nights	Room 1: 3 nights
Room 2: Occupied by Attendee B for 2 nights	Room 2: 2 nights
Room 3: Occupied by Attendee C for 1 night, and Attendee D for 2 nights	Room 3: 3 nights
Room 4: Occupied by Attendee E for 1 night, and Attendee F for 3 nights	Room 4: 4 nights
Room 5: Occupied by Attendee G for 4 nights, and Attendee H for 1 night	Room 5: 5 nights
Total number of rooms nights booked: 3+2+3+4+5 = 17 room-nights	

2. Using the latest HFT, determine the most appropriate carbon coefficient per room night based on hotel location (whether country, city, state, metro area etc.) and hotel stars (whether 4 stars, 5 star)[26]. If the hotel stars are not known or cannot be estimated, then use the "All Stars" category in the HFT.

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	Other national or regional level sources for accommodation emissions	Ecoinvent v.3.9.1
Greenview: Hotel Footprinting Tool		

Table 16: Emission Factors Sources Accommodation

Secondary Data Examples

- Proxy room-nights from similar events or surveys
- Average emissions of one room night from HFT based on location

[25] Note that the room-nights should be calculated separately for different hotels where the attendees are staying. The above example assumed that all attendees stayed in the same hotel. However, if attendees are staying at different hotels of different types across the location, then room nights for all the hotels should be calculated using this above approach.
[26] For any hotel type not in the HFT such as Airbnb, hostels, residences, etc., assume a similar class from the HFT.

- Average emissions per room night from events from industry coefficients
- Average emissions from accommodation from a similar event as proxy
- Average emissions from accommodation from events as proxy using a global study

Measurement Considerations According to Different Tiers

- Basic: Estimate emissions from hotel stays using HFT based on estimated number of room nights.
- Intermediate: Work with hotels and gather primary HCMI data based on room nights information collected from attendee registration forms.
- Advanced: Work with hotels and partners to collect primary data on number of room nights from surveys and get the apportioned HCMI figure.

Apportionment Considerations for Accommodation[27]

Multiple Events in the Same Destination: For example, if the same attendee books four nights in one hotel and attends two different events in the same venue or destination, then the number of nights they stayed to attend each event should be apportioned and considered. However, this is not practically easy to know and account for, and therefore double counting may occur between the two events.

Illustrative Example[28]

A two-day seminar was held which was organised by “ABC company.” 20 of the 50 attendees were booked in the two partner hotels of the organiser. The remaining 30 attendees who travelled for the event stayed at different hotels around the venue for which the organiser does not have any hotel information. However, the organiser, based on assumptions, has estimated that a total of 50 room-nights were used by the 30 attendees. The organiser calculates the emissions from all 50 attendees’ accommodations as follows:

For the 20 attendees booked in the two partner hotels, the organiser approached the hotels to request the HCMI apportioned figure of their room blocks. The total emissions from the two hotels were **150 kgCO_2e.** For the remaining 30 attendees, the hotel estimated 60 room-nights (assuming all 30 attendees stayed for 2 nights each in separate rooms) and used the HFT to output the emissions as **300 kgCO_2e.** Therefore, the total emissions from the accommodations were 150 + 300 = **450 kgCO_2e**

[27] The considerations given are for reference and to show the approach of apportioning based on different options available.
[28] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

4.7 ENERGY

Impact and measurement challenges

Energy is used by event venues to power, heat, and cool events. The share of energy emissions in an event footprint is variable and depends on the efficiency measures in place at the venue, the energy supply from the national grid, and how much onsite renewable energy is in place. Nevertheless, it is a key emission source of a key stakeholder in the industry – venues. The following examples demonstrates the share of venue energy on the total footprint of events based on industry research:

- Research on the US and Canada B2B exhibition industry shows that venue energy contributes 13% of the total event emissions.[29]
- Research on the carbon footprints of events in France show that energy contributes around 1% of event emissions with travel and accommodation included and around 10% without travel and accommodation.[30]

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 1 section of the NZCE Roadmap on p. 22.

What's being measured in this section

The table below shows the boundary of activities that result in energy consumption which should be accounted for in this section.

Boundary	Inclusion/Exclusion	Comments
Energy Activity		
Energy used at event venues	**Included in this section**	
Energy used at an off-site event different than the venue (non-hotel)	**Included in this section**	Follow the guidance and approach given in this section below to apportion the energy consumption from the offsite event
Energy used at an off-site event different than the venue (hotel)	**Included in this section**	For a hotel, event organisers need to work with hotel venue to get the apportioned emissions of the meeting space used using HCMI methodology. Secondary data using Hotel Footprinting Tool (HFT) may also be used to get emissions data from this event using meeting space area.
Energy used at attendee's hotels	**Included in Accommodation section**	
Energy used by vehicles operated or controlled by event organisers or venues	**Included in Local Transportation section**	

[29] https://www.ufi.org/wp-content/uploads/2022/09/Finding_the_Future-Final_Report.pdf
[30] Data from more than 200 events held in France (Source: UNIMEV, Cleo Event Performance Calculator, 2020).

Energy used in transporting or moving goods in/out of the venue or at the venue (Forklifts)	**Included in Logistics and Freight section**	
Energy used by offices of event organisers/suppliers	**Excluded**	Excluded as explained in Appendix A
Emission Source		
Stationary combustion of fuels such as diesel, natural gas, propane, etc.	**Included in this section**	
Purchased electricity, heating, or cooling	**Included in this section**	
Upstream energy used for extraction, generation, transportation and distribution of fuels and electricity before reaching the end consumer	**Included in this section**	
Refrigerants[31]	**Included in this section**	

Table 17: Energy - Boundaries

4.7.1 FUELS USED

Fuels are typically used in venues at events for applications such as:

- Generators – Many events rely on generators to provide power for lighting, sound systems and other equipment. These generators can be powered by diesel or gasoline.
- Heating and cooling systems – To maintain comfortable temperatures for attendees, performers and staff, these systems may use natural gas, propane, etc.
- Cooking equipment – Kitchens or food stalls or trucks that are under direct control of venues/organisers may use cooking equipment that run on propane, natural gas, or other fuels.
- Lighting towers – Lighting towers often used to provide illumination can be powered by generators or battery packs that can consume fuel.

Primary Data[32]

In general, there are two main approaches to how venues can provide primary data for this:

- **Where sub-metering is in place** – in this case the venue reports actual data from the start of the lease to the end of the lease for the specific area used in the event.
- **Where sub-metering is not in place** – In this case the venue reports actual energy data from the start of the lease to the end of the lease for the total area of the venue. In this case, then apportioning has to be done for the specific area leased. Please refer to the section on apportionment considerations below for energy.
  - Amount of fuel used for each fuel type

[31] Note that refrigerants are not an energy source but rather associated with energy use.
[32] Note that the methodology does not require primary sub-metered data for each area, i.e., kitchen, show floor, corridors, etc.

Formula for Converting Primary Data into Emissions

GHG emissions = Amount of fuel consumed (kg) X EF (kgCO_2e/kg)

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
World Resources Institute (WRI): GHG Protocol tool for stationary combustion v.4.1	Emission factors provided by the energy provider, with associated third-party assurance certificate	International Energy Agency (IEA): Emissions Factors 2022
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	Other national level sources for energy emissions	
Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0		
Energy Information Administration (EIA) – United States of America: Carbon Dioxide Emissions Coefficients by Fuel		
Environmental Protection Agency (EPA) – United States of America: GHG Emission Factors Hub		

Table 18: Emission Factors Sources Energy - Fuels

Secondary Data Examples

- Average fuel used at an event using a global proxy
- Average fuel used at an event of the same scale, size and type and proxy
- Average fuel emissions from industry coefficients of the same event profile and segment

Please refer to the status of the NZCE's industry coefficients work in Appendix A

4.7.2 PURCHASED ELECTRICITY, HEATING, AND COOLING

In addition to fuels, any energy purchased from utilities such as electricity, heating, or cooling at event venues are major contributors to emissions and therefore should be quantified.

Primary Data

In general, there are 2 main approaches how venues can provide primary data for this:

- **Where sub-metering is in place** – in this case the venue reports actual data from the start of the lease to the end of the lease for the specific area used in the event.
- **Where sub-metering is not in place** – In this case the venue reports actual energy data from the start of the lease to the end of the lease for the total area of the venue. In this case, then

apportioning has to be done for the specific area leased. Please refer to the section on apportionment considerations below for energy.

The main primary data required are:

- Amount of total electricity used
- Amount of total purchased cooling
- Amount of total purchased heating
- Amount of renewable electricity purchased in form of RECs or EACs
- Amount of renewable electricity onsite

Formula for Converting Primary Data into Emissions

Electricity

- GHG emissions (location-based) = Amount of total electricity consumed (kwh) X Location-based Grid EF (KgCO_2e/kwh)
- GHG emissions (market-based) = (Amount of total electricity purchased – Amount of renewable electricity purchased in form of RECs or EACs) X Market-based Grid EF[33] (KgCO_2e/kwh)

Heating

- GHG emissions = Amount of heating purchased (kwh) X EF (KgCO_2e/kwh)

Cooling

- GHG emissions = Amount of cooling purchased (kwh) X EF (KgCO_2e/kwh)

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Country-specific grid emission factors	Emission factors provided by the energy provider, with associated third-party assurance certificate	International Energy Agency (IEA): Emissions Factors 2022
Association of Issuing Bodies (AIB): European Residual Mix		

Table 19: Emission Factors Sources Energy - Purchased Electricity, Heating, Cooling

Secondary Data Examples

It is recommended that no secondary data should be used for purchasing electricity, as collecting electricity data is generally straightforward and secondary data should only be used for sources where data availability is difficult. But if required, industry coefficients and proxies may be used. **Please refer to the status of the NZCE's industry coefficients work in Appendix A**

[33] If market-based EFs are not available, use location-based grid EFs. For details on different types of market-based EFs, please refer to GHG Protocol's Scope 2 Guidance.

4.7.3 REFRIGERANTS

Refrigerants are chemicals or gases released from air conditioning, refrigeration, or fire suppression equipment. Although minor, refrigerants also form the basis of energy accounting for emissions and phasing out refrigerant gases can play an important role in not just GHG emissions reduction but also for helping in slowing the ozone layer depletion, improving human health and pollution. Reducing refrigerants can also help meet regulatory requirements such as the Kigali Amendment.

Primary Data

- Type of refrigerant gas used in each refrigeration system
- Amount of refrigerant gas leaked from each refrigeration system

Formula for Converting Primary Data into Emissions

GHG emissions for **each** type of refrigerant gas = Amount of refrigerant leaked (kg) X EF (KgCO$_2$e/kg)

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	N/A	N/A
World Meteorological Organization (WMO) Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project—Report	N/A	N/A

Table 20: Emission Factors Sources Energy - Refrigerants

Secondary Data Examples

- Based on industry analysis, use a proxy % for refrigerant emissions of total emissions
- Default leakage rates of refrigerant emissions based on global estimates
- Average industry coefficients

Please refer to the status of the NZCE's industry coefficients work in Appendix A

4.7.4 UPSTREAM EMISSIONS OF ENERGY

Upstream emissions of energy refer to upstream emissions involved in extraction, generation, transportation, and distribution of energy before it reaches the end consumer. The main types of upstream emissions are:

- Upstream emissions from production and transportation of fuels
- Upstream emissions from production and transportation of electricity
- Transmission and distribution losses of electricity

While upstream emissions may be a negligible source of emissions in comparison to other sources of the event footprint, it should be quantified to gain a more comprehensive understanding of the environmental impact of energy production and consumption.

Primary Data

- Amount of fuel consumed by each fuel type
- Amount of electricity consumed

Formula for Converting Primary Data into Emissions

i. Upstream emissions of fuel = Amount of fuel used (kg) X Upstream fuel EF (KgCO_2e/kg)
ii. Upstream emissions of electricity = Amount of electricity used (kwh) X Upstream electricity EF (KgCO_2e/kwh)
iii. T&D loss emissions of electricity = Amount of electricity used (kwh) X Grid loss EF (KgCO_2e/kwh)

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022 - WTT emissions for fuel	N/A	N/A
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022 - WTT emissions for electricity	N/A	N/A
International Energy Agency (IEA): Emissions Factors 2022	N/A	N/A

Table 21: Emission Factors Sources Energy - Upstream Emissions

Secondary Data Examples

- Based on industry analysis, use a proxy % for upstream emissions of total emissions
- Average industry coefficients

Please refer to the status of the NZCE's industry coefficients work in Appendix A

Measurement Considerations for Energy According to Different Tiers

- Basic: Calculate the emission from electricity using venue-specific data with an estimated apportionment to the event.
- Intermediate: Work with venues to get more specific and accurate energy data apportioned for the event using sub-metering. Also, inquire about any fugitive emissions and get estimated data for any refrigerant gas leaks. Include other energy types such as fuels used for the event and estimate the emissions using primary data wherever possible; otherwise, use industry coefficients.

- Advanced: Work with venues to get complete energy data usage during the event using real-time monitoring or data-sharing platforms. Include calculations for refrigerants and upstream energy using the guidance provided above.

Apportionment Considerations for Energy[34]

Apportionment of energy used at venues may be required if multiple events are taking place in the same venue. To calculate the energy usage by each event, apportionment may be required which should be based on:

- % Area used X % Number of days of event[35] X Total Energy

Example:

Two events take place in the same venue on the same day. No sub-metering was available and the total energy consumption reported by the venue that day was 10,000 kwh, and the total hours of operation of the venue that day is 12 hours. The total area of the venue is 50,000 m^2. Apportionment of the total energy usage between the two events is calculated in the follow manner given the following information of the two events:

Item	Event 1	Event 2
Duration of event	5 hours	7 hours
Area used	35,000 m^2	15,000 m^2
	(35,000/50,000) X (5/12) X 10,000	(15,000/50,000) X (7/12) X 10,000
Apportioned Energy	**= 2,917 kwh**	**= 1,750 kwh**

Table 22: Apportionment Considerations Energy

Illustrative Example[36]

Example of a UK event in a venue with sub-metering in place using DEFRA emission factors.

- Gas = 15,000 kwh
- Electricity = 150,000 kwh
- Renewable energy certificates purchased = 100,000 kwh

- Gas emissions: 15,000 kwh X 0.18316 $kgCO_2e$/kwh = 2,747.4 $kgCO_2e$
- Electricity (location-based) emissions: 150,000 kwh X 0.21233 $kgCO_2e$/kwh = 31,849.5 $kgCO_2e$
- Electricity (market-based) emissions: 150,000 kwh – 100,000 kwh = 50,000 kwh X 0.21233 $kgCO_2e$/kwh = 10,616.5 $kgCO_2e$
- Total Emissions (location-based): 2,747.4 $kgCO_2e$ + 31,849.5 $kgCO_2e$ = **34,596.9 $kgCO_2e$**

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[34] The considerations given are for reference and to show the approach of apportioning based on different options available.
[35] or hours, depending on the data available as reported by the venue.
[36] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

- Total Emissions (market-based): 2,747.4 kgCO_2e + 10,616.5 kgCO_2e = **13,363.9 kgCO_2e**

Example of a UK event in a venue without sub-metering in place using DEFRA emission factors.

The venue reports actual **monthly** energy consumption data for gas and electricity. The energy is apportioned to the event based on the area used and the number of days the event was held.

- Total venue gas = 150,000 kwh
- Total venue electricity = 500,000 kwh
- Total venue area = 500,000 m^2
- Total event area used = 50,000 m^2
- Total number of days of event = 2

The below steps show apportionment for both gas and electricity

= (Event area used/Total venue area) X (no. of days of event/30 days in the month venue reported data) X Total energy consumption

Gas = (50,000/500,000) X (2/30) X 150,000 = 1,000 kwh

Electricity = (50,000/500,000) X (2/30) X 500,000 = 3,333 kwh

Gas emissions = 1,000 kwh X 0.18316 kgCO_2e/kwh = **183 kgCO_2e**

Electricity emissions = 3,333 kwh X 0.21233 kgCO_2e/kwh = **708 kgCO_2e**

Total emissions = 183 + 708 = 891 kgCO_2e

4.8 WASTE

Impact and Measurement Challenges

Waste management is one of the most pressing sustainability issues globally. At events, this emission source category has potential for significant emissions generation depending on the disposal method and type of waste material. Studies show that 3.5% of global greenhouse gas emissions result from waste[37].

- Research of the carbon emissions of events in France have found that materials and furniture used at an event contribute between 0.5% (with attendee travel and accommodation emissions included) and 7% (with attendee travel and accommodation emissions excluded) of overall event emissions.[38]

What's Being Measured in this Section

Boundary	Inclusion/Exclusion	Comments
Emission Source		
Emissions from collection, transportation, and disposal of all types of waste	**Included in this section**	Data on miles travelled by waste truck etc. is already included in waste emissions factors and no other primary data is needed other than what is recommended in the sections below.
Emissions from treatment of wastewater	**Included in this section**	

Table 23: Waste - Boundaries

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 2 and 3 sections of the NZCE Roadmap on pp. 25 and 28.

4.8.1 SOLID WASTE

While managing solid waste at events is extremely important, the emissions resulting from the waste disposed also need to be properly quantified to get a comprehensive carbon profile of the event. Therefore, guidance on quantifying emissions from waste is provided below.

Primary Data to be Collected

The main data point needed for quantifying waste emissions is:

- Volume[39] or weight of waste generation of each material type and its disposal method.

Note that exact information on material type (cans, bottles, food, paper, glass, etc.) and disposal method (recycled, donated, landfilled, incinerated, composted, etc.) is needed, as the emission factors vary for both.

[37] Climate Watch (2023), Historical GHG Emissions.
[38] Data from more than 200 events held in France (Source: UNIMEV, Cleo Event Performance Calculator, 2020).
[39] If waste generation data is given in terms of volume and needs to be converted into weight, please refer to the EPA's volume to weight conversion factors.

Formulae for Converting Primary Data into Emissions

GHG emissions of waste = Amount of waste generated for each material type and disposal method (mass or volume) X EF for that material type and disposal method (KgCO_2e/unit).

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	Environmental Protection Agency (EPA) – United States of America: Supply Chain Greenhouse Gas Emission Factors v1.2 by NAICS-6	Ecoinvent v.3.9.1
Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0	Other national or regional level sources for waste emissions	
Environmental Protection Agency (EPA) – United States of America: GHG Emission Factors Hub		

Table 24: Emission Factors Sources Solid Waste

Secondary Data Examples

- Industry benchmarks: Industry benchmarks can provide an estimate of the average amount of waste generated per attendee at similar events. These benchmarks can be used as a proxy for estimating the amount of waste generated at the event. Industry coefficients can also be used as a proxy for estimating average emissions from waste per attendee.
- Venue data: Some venues may have data on the amount of waste generated at previous events held at the venue. This can be used as a proxy for estimating the amount of waste generated at the current event.
- Waste audits: Waste audits can provide an estimate of the amount and types of waste generated at the event. While this is not primary data, it can be used as a proxy for estimating the amount of waste generated and associated emissions.
- Local waste data: Local waste data can be used to estimate the average amount of waste generated per capita in the area where the event is being held. This can be used as a proxy for estimating the amount of waste generated at the event.
- Split between % landfilled and % diverted based on regional estimates.
- Surveys: Surveys of attendees or vendors can provide insight into the types and amounts of waste generated at the event. While this may not provide a complete picture of the waste generated, it can be used as a proxy for estimating the amount of waste generated and associated emissions.

Measurement Considerations According to Different Tiers

- Basic: Estimate emissions from waste generated at an event, using primary data wherever possible and using proxies to fill gaps and to determine the split of % landfilled and % diverted. Focus on events that are more likely to generate waste, such as food shows, etc.

- Intermediate: Work with vendors/waste haulers to get primary data on waste generation and disposal method. Also determine the emissions apportioned for the event. Use industry coefficients to fill the gaps.
- Advanced: Undertake waste audits and track primary waste data in real-time. Also collaborate with vendors to confirm the waste disposal method. Include wastewater emissions in calculations.

Apportionment Considerations for Waste[40]

Apportionment of waste generation at venues may be required if multiple events contract the waste to the same vendor. Therefore, apportioning emissions from waste generation may be done using either of the following options as examples:

- Number of attendees
- Duration of event
- Area used

For example, for two events taking place at the same venue, the total waste generated from the venue for their event period is 1,000 tonnes. The total number of attendees from both the events was 500 and the total area used by both the events is 50,000 m^2. The total number of hours the venue is in operation in a given day is 12 hours.

Apportionment based on	Event 1	Event 2
No. of attendees % share Waste	150 30% 300 tonnes	250 70% 700 tonnes
Duration of event % share Waste	5 hours 42% 420 tonnes	7 hours 58% 580 Tonnes
Area used % share Waste	35,000 m^2 70% 700 Tonnes	15,000 m^2 30% 300 Tonnes

Table 25: Apportionment Considerations Solid Waste

Illustrative Example[41]

An event generated around 30,000 kgs of waste, of out of which 20% was mixed recyclables, while the rest were landfilled waste including 30% food waste, and the remaining 50% was mixed municipal solid waste (MSW). The organiser used the appropriate emissions factors to quantify the emissions for the different waste types as follows:

- Mixed Recyclables – 20% X 30,000 = 6,000 kgs X 0.09 = 540 $kgCO_2e$
- Food Waste – 30% X 30,000 = 9,000 kgs X 0.58 = 5,220 $kgCO_2e$
- MSW – 50% X 30,000 = 15,000 kgs X 0.52 = 7,800 $kgCO_2e$
- Total emissions = 540 + 5,220 + 7,800 = **13,560 $kgCO_2e$**

[40] The considerations given are only a reference to show the approach of apportioning based on different options available.
[41] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

4.8.2 WASTEWATER

Unlike water, which does not have emissions on its own, wastewater discharge (treated or untreated) may generate emissions. Therefore, it is important that wastewater be accounted for in the total event emissions footprint.

Primary Data to be Collected

- Total wastewater discharged in either litres, gallons, or m^3.

Formula for Converting Primary Data into Emissions

GHG emissions of wastewater = Amount of wastewater discharged (mass or volume) X Water discharge EF ($KgCO_2e$/unit)

Emission Factors Sources:

Highly recommended	Recommended	Additional sources
Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	Environmental Protection Agency (EPA) – United States of America: Supply Chain Greenhouse Gas Emission Factors v1.2 by NAICS-6	Ecoinvent v.3.9.1
Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0	Other national or regional level sources for waste emissions	

Table 26: Emission Factors Sources Wastewater

Secondary Data Examples

- Average wastewater discharge from a similar event as proxy
- Average emissions from wastewater from a similar event as a proxy
- Industry coefficient for emissions from wastewater in $kgCO_2e$/unit
- Industry coefficient for emissions from wastewater in $kgCO_2e$ per attendee

Measurement Considerations According to Different Tiers

Refer to section 4.8.1

Apportionment Considerations for Wastewater Discharge[42]

Apportionment of wastewater discharge at venues may be required if multiple events are connected to same sewage collection system and treatment plant. Therefore, apportioning emissions from wastewater discharge may be needed and may be calculated using either of the following options as examples:

- Number of attendees
- Duration of event

[42] The considerations given are for reference and to show the approach of apportioning based on different options available.

- Area used

For example, for two events taking place at the same venue, the total wastewater discharge of the venue for their event period is 1,000 litres. The total number of attendees from both the events was 500 and the total area used by both the events is 50,000 m^2. The total number of hours the venue is in operation in a given day is 12 hours.

Apportionment based on	Event 1	Event 2
No. of attendees % share Wastewater discharge	150 30% 300 Litres	250 70% 700 Litres
Duration of event % share Wastewater discharge	5 hours 42% 420 Litres	7 hours 58% 580 Litres
Area used % share Wastewater discharge	35,000 m^2 70% 700 Litres	15,000 m^2 30% 300 Litres

Table 27: Apportionment Considerations Wastewater

Illustrative Example[43]

The venue reported the monthly wastewater discharged data to the event organiser. The wastewater discharge in the month in which the event was organised was 5,000 m^3. The event organiser apportioned the monthly figure to the number of days of its event and calculated the emissions:

- Wastewater for the month: 5,000 m^3
- Wastewater apportioned for 2 days of the event: (5,000 / 31) X 2 = 322.6 m^3
- Wastewater discharge emission factor from DEFRA: 0.272 kgCO2e per m^3
- Emissions: 322.6 X 0.272 = **87.7 kgCO_2e**

[43] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

4.9 DIGITAL CONTENT AND COMMUNICATION

Impact and Measurement Challenges

Especially after the Covid-19 pandemic, global awareness about the emissions impact of using information and communications technology (ICT) has risen significantly. ICT's contribution to global greenhouse gas emissions has been estimated at 3.7%[44]. When it comes to events, the impact of digital content and communication can vary significantly based on how much they are used during and before the event.

Measurement of emissions from the digital components is challenging because:

- Sources and data availability are often inadequate or unclear.
- The coefficients of emissions vary significantly from source to source as there is no one clear and defined methodology that provides guidance on calculating emissions from various digital sources.
- Variation in methodologies makes it difficult for NZCE to recommend a specific source to quantify emissions.

Nevertheless, based on research, this methodology provides guidance on emission quantification and has also mentioned the sources and tools that may provide a genuine estimate on carbon emissions from digital sources at events. Users of the methodology are welcome to use other sources which they believe offer better representation of their activities and are suggested to share these with NZCE so others in the industry can benefit and quantify emissions uniformly and consistently. Also, note that the methodology in its current form acknowledges that accurate quantification of emissions from digital aspects of events may not be possible, and the guidance provided should be used for estimation purposes to get a better representation of event footprint. The methodology will update its guidance when new and better research is published.

What's Being Measured in this Section

Note that the below emission sources were found to be more common based on research and industry practices. The list may be revised in the future versions.

Boundary	Inclusion/Exclusion	Comments
Emission Source		
Virtual Conferences Direct emissions – computer emissions Indirect emissions – server energy usage	**Included in this section**	
Search engine queries	**Included in this section**	
Website visits	**Included in this section**	
Emails	**Included in this section**	
Data centre or cloud usage	**Included in this section**	
Video streaming	**Included in this section**	

Table 28: Digital Content & Communication - Boundaries

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[44] Climate Impact Partners (2021), The Carbon Footprint of the Internet

Responsibilities and prioritisation of actions (not limited to measurement) for this emission source category are outlined in the Action Area 1 section of the NZCE Roadmap on p. 22.

Primary Data to be Collected

Virtual Conferences

- Direct emissions - Computer Emissions
  - Number of attendees
  - Duration of conference
  - Lifecycle emissions of computers/laptops – This can be sourced from Environment Production Declaration (EPD) reports from various computer manufacturing companies like Dell, Apple, Lenovo, etc. (For example, https://www.dell.com/en-us/dt/corporate/social-impact/advancing-sustainability/climate-action/product-carbon-footprints.htm#tab0=0) (Based on research[45] can assume to be 340 kgCO_2e per computer)
  - Average service life of computer (based on research, assume to be 4 years[45])
  - Average daily hours of computer use (based on research, assume to be 2 or available more accurate estimates[45])

- Indirect emissions –server energy use
  - Number of servers used (Based on research, it is typically found that only 1 server is used to host a Zoom meeting with hundreds of participants[45])
  - Duration of conference
  - Server power rating (this is varying and complicated for each location and components, but based on research, an average power rating for 1 server is around 0.594 kW/server[45])
  - Electricity emissions factor

Search Engine Queries

- Number of queries

Website Visits

- Number of website visits for each website

Email

- Number of emails sent and received.

Cloud Usage

- Type of cloud (AWS, Azure, Google Cloud, other)
- Location of data center
- Number of hours of usage

Video Streaming

- Number of hours of video stream
- Device type (Laptop, Smartphone, Tablet, Television)
- Bitrate (SD, HD, Ultra/4k)
- Network Type

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[45] Grant Faber (2021): A framework to estimate emissions from virtual conferences, International Journal of Environmental Studies, DOI: 10.1080/00207233.2020.1864190

- Country

Formula for converting Primary Data into Emissions and Emission Factor Sources

Virtual conferences

- Direct emissions - Computer Emissions =

Number of attendees X Lifecycle emissions of computer or laptop X (Duration of conference/service life of computer X 365 X average daily hours of computer use)

- Indirect emissions – Data centre/server energy use =

Electricity emission factor X No. of servers X Duration of conference X Server power rating

Search Engine Queries =

Number of queries X Emissions per query (assume to be 0.0002 kgCO_2e/query)[46]

Website Visits =

This is generally very complicated to quantify, and several tools and calculators do not have an agreed upon methodology. Therefore, the methodology in this version will not be able to suggest a specific source or quantification method. Therefore, users are recommended to find appropriate ways to quantify emissions from their website visits at events.

In one example, Website Carbon was found to generate easy outputs and provided transparent and consistent methodology for their assumptions and sources. This source requires users to enter the URLs of the websites visited and provides the emissions coefficient per visit. Users can multiply the coefficient with the estimated number of times the website was accessed for each website.

Email =

As above with website visits and based on ICT complexity, there is no one credible source that is used globally, and therefore NZCE is not able to recommend a specific source. However, one of the popular and frequently cited sources is a book, "How Bad are Bananas? The Carbon Footprint of Everything' (2020)." The source provides estimates of emissions coefficients per email based on the type of email, i.e., whether short or long email, etc. Users are therefore advised to explore additional appropriate sources and may use the above source as mentioned to get high-level estimates of their footprint. **The source provides a range of 0.03 gCO_2e to 26 gCO_2e per email.**

Cloud Usage =

Due to complexities in calculating emissions from data centres and cloud usage, the following options may be used (listed from most preferred to least):

- To quantify the emissions from cloud usage, the methodology recommends that users get their emissions data directly from cloud service providers such as Azure, Google Cloud, Amazon Web Services, or others. Each of these cloud service providers offer direct services where their cloud customers can quantify the emissions of their cloud usage. This method is, however, paid at times but may be the most accurate and representative method of quantification.

- Users are also recommended to explore the sustainability reports and metrics published by cloud service providers that sometimes give an indication of the carbon footprint of the cloud usage of their customers.

[46] https://googleblog.blogspot.com/2009/01/powering-google-search.html

- If none of the above options are feasible, then users are suggested to explore and identify a method that provides a high-level estimate of their cloud/data centre carbon footprint that better represents their location/activity/business.

- If users are not able to find a method of their own, they may use the following resources:
  - Cloud emission factors from Climatiq. This source provides emission factors for cloud usage based on cloud compute, memory, networking, storage, and power usage effectiveness (PUE) of cloud service providers. Their emission factors are based on the methodology from Cloud Carbon Footprint (CCF) which of all other studies in public domain provides the most detailed, transparent and updated methodology, assumptions and factors.
  - Schneider Electric's Data Center Carbon Footprint Calculator – The calculator determines the emissions from data centre based on three variables i.e., location, power usage effectiveness (PUE) and IT load.

Video Streaming =

Due to complexities in calculating emissions from video streaming platforms, the following options may be used (listed from most preferred to least):

i. To quantify the emissions from video streaming platforms, the methodology recommends that users get their emissions data directly from websites and published reports of video streaming providers such as Amazon, Netflix, YouTube, etc. Their reports sometimes give an indication of the carbon footprint of the video streaming usage of their customers.
ii. If none of the above options are feasible, then users are suggested to explore and identify a method that provides a high-level estimate of their video streaming that better represents their location/activity/business.
iii. If users are not able to find out a method of their own, they may use IEA's commentary and dashboard for measuring carbon footprint of streaming video. For this, users may need data on the number of hours video streamed, device type, video quality, location, etc. for IEA's dashboard to output emissions.

Secondary Data Examples

- Average emissions from digital sources at similar events

- Average number of website visits or number of emails sent or search engine queries at similar events.

- Average duration of virtual conference taken place

Measurement Considerations According to Different Tiers

- Basic: Conduct an initial screening of the potential sources of emissions from digital content that are material[47] for the event. Try and gather some information for the material sources and quantify using proxies.

- Intermediate: Calculate at high level using external tools/databases at least for servers and video streaming platforms used in those events where there were a lot of tech-based activities.

- Advanced: Work with data centre providers or video streaming providers and check their reports to get the emissions from usage. Engage with IT companies in the value chain to understand the impact and to improve the calculation and data quality.

[47] The methodology does not define materiality at this stage and this may vary from event to event

Illustrative Example[48]

Before an event, one pre-virtual meeting was held by the organisers for briefing and orientation. Also, the conceptualisation of the event involved sending invites to 50 participants via email. Therefore, the organiser calculated the missions from the pre-virtual meeting and 50 invite emails as follows:

Emissions from one pre-virtual meeting –

Computer Emissions

- No. of attendees = 10
- Duration of meeting = 1 hour
- Life cycle emissions of computer = 340 kgCO_2e
- Average service life of computer = 4 years
- Average daily use = 2 hours/ day
  = Number of attendees X Lifecycle emissions of computer or laptop X (Duration of conference/service life of computer X 365 X average daily hours of computer use)
  = 10 X 340 X [1/ (4 X 365 X 2)] = **1.16 kgCO_2e**

Server Usage

- Number of servers used = 1
- Duration of conference = 1 hour
- Server power rating = 0.594 kW/server
- Electricity emissions factor = 0.43 kgCO_2e/kwh

= Electricity emission factor X No. of servers X Duration of conference X Server power rating
= 0.43 X 1 X 1 X 0.594 = **0.255 kgCO_2e**

Emissions from 50 invite emails –
Based on the source provided above, the average emissions of the range given was taken which is 13gCO_2e per email. Therefore, the emissions from 50 email are **0.65 kgCO_2e.**

The total emissions are = 1.16 + 0.255 + 0.65 = **2.065 kgCO_2e.**

[48] The values and figures used for emissions factors are for illustrative purposes only and should not be used for practical calculation.

5 KEY EVENT LEVEL METRICS

This section provides details on some common metrics that may be used if reporting event level emissions. Note that this section does not mandate or require entities to report event level emissions using these metrics, as these metrics are provided for guidance and reference.

Data type/Item	Metric
General Event Information	
Name of event	
Date	
City/Country	
Number of attendees	
Floor Area	Gross Surface Area (m^2) Net Surface Area (m^2)
Event Type	Conference Incentive Exhibition Music festival Sports tournament Meeting
Event Industry	Fashion Retail Food & Beverage Sports Building Manufacturing Industry Pharmaceutical Other
Event Reach	International Domestic
Name of Organiser	
Name of Venue	
Emission Category	
Production and Materials	Weight of materials/furniture types used (kg) Amount spent on purchases and rentals
Freight and Logistics	Distance shipment travelled by mode of transport type (km) Weight or volume of shipment transported (kg or m3 or litres)
Food and Beverage	Total number or weight of ingredients used (No. or kg) Total number or weight of meals provided and type (No. or kg) Total number or weight of F&B items procured (No. or kg) Amount spent on catering

Travel to and from the Destination	Mode of transport Fuel consumption (litres) Distance travelled (km)
Local transportation	Mode of transport Fuel consumption (litres) Distance travelled (km)
Energy	Amount of total energy used (kwh) Amount of total energy from renewable sources (kwh)
Accommodation	Total room nights for each accommodation type and location
Waste	Total waste generated by material type and disposal method (kg)
Digital Content & Communication	Number and hours (as applicable) of emails sent, websites searches, and video conferences organised
Event Emissions	
Total emissions	Total absolute event emissions (kgCO_2e) Total emissions intensity (kgCO_2e per attendee) Total emissions intensity (kgCO_2e per m^2)
Total emissions per category	Total absolute emissions (kgCO_2e) Total emissions intensity (kgCO_2e per attendee) Total emissions intensity (kgCO_2e per m^2) % of total emissions

Table 29: Key Event Level Metrics

6 MULTIPLE EVENT EXTRAPOLATION AND GAP FILLING – AGGREGATE LEVEL

Ideally, all event emission footprints in a company's portfolio should be calculated using primary data. Realistically, this is not possible given the nature of the industry, with the different types of events and entities involved. Therefore, there may be some events for which no data is available or data available for only a few categories. Thus, this section aims to provide guidance on filling data gaps and extrapolation. It is important to note that actual data is always preferable to extrapolated data, and where actual data exists and has been internally validated, it should always be used.

Overall, there are four steps to the multiple event extrapolation process:

1. Group similar events according to location of event segment/type as available
2. Calculate the average emissions intensity of those groups which has data available
3. Extrapolate for the event's missing data by matching each event to the corresponding best available group in step 1, then multiply the group's metric by the event's intensity metric for which data is available
4. Consolidate portfolio-wide event footprint by consolidating the figures for Base Event Data Set + Extrapolated Event Data Set.

Grouping Hierarchy (1 – most preferred, 5 – least preferred)

Group Type	Grouping
1	Group of events within the same city **and** same segment/type as determined by the company, i.e., event size (small, medium, large, etc.), event industry (automobile, pharmaceutical, fashion, etc.), event type (trade show, conference, festival, etc.)
2	Group of events within the same country **and** same segment/type as determined by the company, i.e., event size (small, medium, large, etc.), event industry (automobile, pharmaceutical, fashion, etc.), event type (trade show, conference, festival, etc.), event reach (international, domestic)
3	Group of events within the same segment/type as determined by the company i.e., event size (small, medium large etc.), event industry (automobile, pharmaceutical, fashion, etc.), event type (trade show, conference, festival, etc.), event reach (international, domestic)
4	Group of events within the same city **or** country
5	All other events

Table 30: Multiple Event Extrapolation Grouping Hierarchy

Note: A minimum of two events within the same group type should be available for the group to be considered representative of deriving coefficients. If a minimum of two events for any of the five-group type is not available or if there are outliers within the group, then industry coefficients or proxies should be used.

See below as an example:

Step 1: An event organiser company called **XYZ Events Co.** has organised eight events in a reporting year. Out of the eight events, the company has actual total emissions data for six events and no/missing data for two events. An extrapolation for the remaining two events can be done using the steps below:

TOTAL EVENTS OF XYZ EVENTS CO.		
Country	**Number of Events**	**Total attendees**
US	3	75,000
India	3	100,000
Singapore	1	1,500
Thailand	1	1,500
Total	**8**	**178,000**

Table 31: Multiple Event Extrapolation Total Events Example

The geographic and segmentation breakup of the eight events are as follows:

Country	City	Event Industry	Total Number of Events	Total Attendees
US	New York	Logistics	1	25,000
US	California	Buildings	1	15,000
US	Las Vegas	Automotive	1	35,000
India	Delhi	Food	1	40,000
India	Delhi	Food	1	30,000
India	Delhi	Food	1	30,000
Singapore	Singapore	Food	1	1,500
Thailand	Bangkok	Automotive	1	1,500
Total			**8**	**178,000**

Table 32: Multiple Event Extrapolation Segmentation Example

Step 2: XYZ Events Co. has calculated the average emissions intensity for each of the event grouping category, i.e., Geography + Event Type as shown below for the six events that had data. **Note that this example uses attendees as the intensity denominator for illustrative purposes. Companies may use an alternative denominator as appropriate.**

BASE EVENT DATA SET

Country	City	Event Industry	Total Number of Events	Total Emissions (tCO_2e)	Total Attendees	Emissions per Attendee
US	New York	Logistics	1	1,500	25,000	0.06
US	California	Buildings	1	1,000	15,000	0.07
India	Delhi	Food	1	2,000	40,000	0.05
India	Delhi	Food	1	2,500	30,000	0.08
Singapore	Singapore	Food	1	300	1,500	0.20
Thailand	Bangkok	Automotive	1	250	1,500	0.17
Total			**6**	**7,550**	**113,000**	**0.07**

Table 33: Multiple Event Extrapolation Base Event Data Set Example

Step 3: For the remaining two events that have no data and for which the emission intensity to be extrapolated, group these events according to grouping hierarchy as available and shown above in table X, and extrapolate emission intensity:

The remaining two events which have no/missing data are:

EXTRAPOLATED EVENT DATA SET

Country	City	Event Industry	Total Number of Events	Total Attendees
US	Las Vegas	Automotive	1	35,000
India	Delhi	Food	1	30,000
Total			**2**	**65,000**

Table 34: Multiple Event Extrapolation Extrapolated Event Data Set Example

For the first event in the US, there is no Group Type 1 available as the segments do not match for the US. Also, there is an event within the same event industry (Event in Thailand), but it is only one and therefore not representative. Therefore, to extrapolate the emissions for this event in the US, a country Group Type 4 should be used.

Therefore, from the Base Event Data set table, above, the average Emissions per attendee for the US is = (1,500 + 1,000)/(25,000 + 15,000) = **0.062 tCO_2e/attendee**

For the second event in India that needs extrapolation, Group Type 1 is available as there are two other events in Delhi, India and both are in the Food industry which can create an average coefficient.

Therefore, from the Base Event Data set table, above, the average Emissions per attendee for Delhi + Food Industry is = (2,000 + 2,500)/(40,000 + 30,000) = **0.065 tCO_2e/attendee**

Using the above two coefficients, we can calculate the emissions for the Extrapolate Event Data Set as below:

EXTRAPOLATED EVENT DATA SET

Country	City	Event Industry	Total Number of Events	A - Total Attendees	B - Emissions Intensity	C - Emissions (tCO_2e) A X B
US	Las Vegas	Automotive	1	35,000	0.062	2,170
India	Delhi	Food	1	30,000	0.065	1,950
Total			**2**	**65,000**		**4,120**

Table 35: Multiple Event Extrapolation Extrapolated Event Data Set Emissions Example

Step 4: The final step is to consolidate the Extrapolated Event Data Set and Base Event Data Set to get the total company's event footprint as follows:

BASE EVENT DATA SET + EXTRAPOLATED EVENT DATA SET

Country	City	Event Industry	Total Number of Events	Total Emissions (tCO_2e)	Total Attendees	Emissions per Attendee
US	New York	Logistics	1	1,500	25,000	0.06
US	California	Buildings	1	1,000	15,000	0.07
US	Las Vegas	Automotive	1	2,170	35,000	0.062
India	Delhi	Food	1	2,000	40,000	0.05
India	Delhi	Food	1	2,500	30,000	0.08
India	Delhi	Food	1	1,950	30,000	0.065
Singapore	Singapore	Food	1	300	1,500	0.20
Thailand	Bangkok	Automotive	1	250	1,500	0.17
Total			**8**	**11,670**	**178,000**	**0.066**

Table 36: Multiple Event Extrapolation Base Event and Extrapolated Event Data Set Example

7 CONSIDERATIONS FOR SETTING BASELINES

This section provides basic guidance and considerations for any entity that wants to explore setting a baseline. Note that this methodology acknowledges that setting an event-level baseline may not be very common in the industry and therefore does not require or mandate any company to comply with the guidance provided. The aim of this section is to provide context and factors to consider in various scenarios of setting a baseline and targets in the industry.

Additional information about setting a baseline can be found in the NZCE Roadmap **in Section 3.**

7.1 APPROACHES TO BASELINE AND TARGET SETTING

Companies have multiple approaches to set a baseline for their events depending on their organisational strategy. These approaches are based on two key factors: emission categories and number of events. Some strategies may be more popular than others.

NZCE Emission category	No. of Events	Example
Single	Single	Company ABC commits to reduce the emissions from **energy consumption** from its flagship **"XYZ Event"** by 50% by 2030 from 2019 baseline
Single	Multiple	Company ABC commits to reduce the emissions from **energy consumption** across **all events** that it organises by 50% by 2030 from 2019 baseline
Multiple	Single	Company ABC commits to reduce the emissions from **energy consumption, production, waste, and F&B** from its flagship "**XYZ Event**" by 50% by 2030 from 2019 baseline
Multiple	Multiple	Company ABC commits to reduce **all emissions** across **all events** that it organises by 50% by 2030 from 2019 baseline

Table 37: Approaches to Baseline and Target Setting

7.2 CHOOSING THE BASELINE YEAR

To set a baseline, companies must first identify the reference year of the event(s) against which emissions will be compared in subsequent years. The reference year should be chosen carefully, considering the following aspects of the event:

- Verifiable data on emissions as per the sources in section 2.2 listed in this methodology. It is recommended that the year should be the most recent year for which data is available.
- Year in which the event(s) is most representative in terms of its size, duration, number of attendees, location, activities etc. The year should also not be affected by any external events such as pandemics, geopolitics, natural disasters, etc. which could affect the typical activities of the event.
- It should have sufficient forward-looking ambition. While past progress deserves to be credited, the initiative's objective is to promote action that has not yet been accomplished and to further decarbonisation of events.

- While it is common for the baseline to be a single year, setting baselines for events is challenging given that the same event may vary its venue or location year to year. Therefore, it is difficult to make a like-for-like comparison and to provide an accurate assessment of emission changes over time. Instead, a multi-year average may be considered to help smooth out and account for the variations as opposed to a single baseline year which may be unrepresentative of the event in the subsequent year. Please see the table below for the approach for selecting a baseline year.

Location[49]	Venue	Approach for selecting a baseline year
Same	Same	If the venue and location of the event is the same in all the years, then a single baseline year may be selected that is representative, most recent, forward looking, has verifiable data
Same	Different	If the event takes place in the same location, but the venue is different each year, then regardless of the differences in the measures taken by the venues, the baseline year may still be a single year that is representative, most recent, forward looking, and has verifiable data
Different	Different	The location and venue of a typical event changes every year. In this case, because the emissions profile can vary significantly, it wouldn't be a like-for-like comparison to choose a single baseline year. Therefore, it may be more logical to have a weighted average emission for multiple years as the baseline. Please see the example below.

Table 38: Baseline Scenarios

Multiple Year Weighted Average Baseline Illustrative Example:

An event called "ABC Summit" has been held in Stockholm, Bangkok, and Dubai over the last three years (2019, 2020 and 2021) respectively. The organiser of the event wants to set a target to reduce **all** emissions from the event by 50% by 2030. The baseline has not been determined yet because choosing a single baseline may skew the progress. The first year in Stockholm was comparatively less emissions-intensive due to a cleaner grid, more public transport options, and prevalence of more sustainable practices in the city. Therefore, the organiser is considering setting a multiple year weighted average baseline to account for the differences in emissions profiles across the host cities. To do this, the following approach may be used:

The Weighted Average may be calculated as:

Weighted Average = (Sum of (Emissions × Attendees)) / Total Attendees[50]

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[49] An event would be considered to be in a different location if it takes place in a different country each year. A few exceptions may be considered such as events that take place only in Central Europe or in Nordic regions as technically, they may be in different countries within the region, but still have very similar emissions profile and therefore can be considered same location. Different location based on different city in the same country may be considered only if the grid factors are different for each city or there is significant difference in terms of emissions profile among cities in the same country. An example of this would be cities in countries such as the US, Canada, Australia, India, etc., where different provinces/cities/states have different emissions profiles.

[50] Note that in the example, attendees have been chosen as the appropriate intensity metric. Area may also be used as an alternative.

Let's say the following data on emissions and attendees are given for the event for the three years:

Item	2019 Stockholm	2020 Dubai	2021 Bangkok
Attendees	1,200	1,000	600
Emissions (KgCO_2e)	15,000	60,000	80,000

Table 39: Baseline Event Example

The first steps would be to calculate the Emissions X Attendees

Item	2019 Stockholm	2020 Dubai	2021 Bangkok	Totals
Attendees	1,200	1,000	600	2,800
Emissions (KgCO_2e)	15,000	60,000	80,000	155,000
Emissions X Attendees	18,000,000	60,000,000	48,000,000	126,000,000

Table 40: Baseline Event Calculation Example

The weighted average would be: 126,000,000 / 2,800 = **45,000 KgCO_2e**

Therefore, the baseline year for the "ABC Summit" event would be the average of 2019-2021 with the emissions value of 45,000 KgCO_2e.

7.3 DEFERRING THE BASELINE IN CASE OF DATA CHALLENGES

Accurate quantitative measurement for all the nine categories is currently not feasible and largely depends on the availability of reliable, consistent approaches to quantification and emission factors. In such cases, setting a baseline and targets becomes challenging. Therefore, it is a common practice to defer the baseline for some categories with difficult data requirements to encourage planning and engagement actions from start of the net zero journey rather than simply focusing on accurate quantification.

Deferring the calculation for some categories enables a company to continue its net zero journey without holding it back. Deciding the years to defer some of the categories is currently being reviewed by the industry and will be included in the next versions of the methodology as documented in the Appendix A.

Illustrative Example

In 2019, an event organiser company had set a target to reduce the total emissions from one of its most popular annual events "ABC Summit" by 50% absolute emissions by 2030 from its baseline of 2019. At that time, the organiser had reliable data for all nine categories except two: Freight and Logistics and Accommodation. Therefore, the organiser did not include the emissions from these two categories in its 2019 baseline. From 2019 up until now in 2023, the company had shown great commitment and had undertaken various efforts to work with its partners to collect data. It also engaged with logistics service providers and partner hotels to decarbonise and reduce emissions.

Finally, in 2023 the organiser was able to get good data on Freight and Logistics and Accommodation for ABC Summit. Therefore, the company has now decided to re-baseline and adjust its original figure.

- In 2019, the total emissions of "ABC Summit" from seven categories were 20,000 kgCO_2e. Therefore, as per their 2030 target set, the event's target was to halve these emissions to 10,000 kgCO_2e.

- In 2023, they were able to get the emissions data for the remaining two categories which totalled 6,000 kgCO_2e. The company applied the same calculation method to evaluate the emissions in 2019 and determined the emissions from the two new categories as having been 7,000 kgCO_2e in 2019. With the updated emissions, the company needs to adjust their emissions reduction target based on the new starting point:
  - Updated 2019 Baseline Emissions = 20,000 + 7000 = 27,000 kgCO_2e
  - Updated Target Reduction = 50% of 27,000 = 13,500 kgCO_2e

Moving forward, the event organiser will track emissions reductions from the updated baseline of 27,000 kgCO_2e to measure its progress toward the new target of 13,500 kgCO_2e reduction. By performing a re-baseline and updating the baseline emissions with the reliable data for the Freight and Logistics and Accommodation categories, the event organiser ensures that their emissions reduction target remains relevant and reflects the most accurate starting point for its emissions reduction efforts. This iterative approach allows the event organiser to continually improve the accuracy and effectiveness of their emissions reduction strategies over time without having to compromise on the decarbonisation efforts.

APPENDICES

APPENDIX A: PENDING ISSUES IN THIS METHODOLOGY VERSION

Water Supply and Distribution

While water consumption itself does not typically produce any GHG emissions, there are several indirect sources of emissions that can be associated with water consumption. Energy consumption from distribution of water as well as the transportation of water in the network until it reaches the end consumer has a carbon footprint. However, the impact of water as an emission source was identified as relatively small compared to other emission sources and therefore out of scope for this version of this methodology. Future versions should identify how the emissions of water can be measured. Nevertheless, water as an emission source is partly included in this methodology through bottled water in the food and beverage section, as well as through wastewater in the waste section.

Embodied Carbon of the Venue or Building

This emission source category has been excluded from the scope of the first version of this measurement methodology since in comparison to the other emission sources covered, impacts and influence of most stakeholder groups are limited.

Land Use Change Emissions of New Buildings or Infrastructure Created

This is applicable for very large events such as sports tournaments, where new stadiums must be built by clearing out existing land. Measuring the emissions associated with such land use change emissions is excluded from the scope of this methodology due to low prevalence of such practice and insufficient technical knowledge and data availability in the industry.

Scope 1 and 2 of Event Organiser's Workplace and Office

The Scope 1 and 2 emissions of the event organiser’s workplaces and offices are out of bounds to include them in the methodology and are deemed insignificant to the event’s total footprint. Also, their scope 1 and 2 data would already be included and reported as part of their organisational footprint in their respective inventories.

Scope 3 Emissions of Hotels

While emissions related to the hotel stay of participants is included in section 4.6 as per the HCMI methodology, the Scope 3 emissions of the hotel (such as hotel’s emissions from purchased goods and service, business travel, staff commuting, etc.) are excluded from the HCMI and remain out of scope for this methodology. The only Scope 3 emission of hotels that is currently included in HCMI is the emissions from the hotel’s outsourced laundry. NZCE is also advocating for various best practices for choosing accommodation providers when organising events and therefore the Scope 3 may indirectly be addressed. In addition, the Scope 3 of hotels stays is being addressed in a separate initiative called HCMI 3.0 led by the Sustainability Hospitality Alliance (SHA) and Greenview. In this document, detailed guidance on addressing and measuring Scope 3 will tentatively be released in 2024.

F&B Purchased by Attendees at Venue Cafés or Food Trucks

In general, the boundary of the methodology only includes the F&B directly purchased by the event organiser and exhibitors. F&B in a café in the venue but outside of the actual event would be similar to attendees leaving the venue to have a meal at a nearby restaurant and thus would be excluded from the boundary of measurement.

Stopovers and Detours for Local transportation

The methodology assumes that all attendees will only travel to and from the hotel and venue. Any interim stopovers or detours are outside the scope and control of the event's value chain and are therefore excluded from measurement.

Timeline Associated with the Three Tiers

The timeline associated with the three tiers will be taken up in the next version of the methodology after continued detailed consultation with the industry, which has so far led to inconclusive results and has therefore been determined as outside the scope of the current version.

Years to Defer Baseline for Emission Categories

The year to defer setting the baseline at event level for some categories is currently being evaluated and reviewed by the industry members and may be taken up in the subsequent versions of the methodology.

Apportionment on Materials such as Carpets, Furniture, Rental Equipment, and Shell Scheme, etc.

Currently, the industry practices on apportioning above items are unclear and inconsistent and therefore, the methodology in its current form was not able to provide clear guidance on this topic. The industry will be further consulted on this, and guidance will be provided once industry agreement has been established.

Coefficients and Proxy Data

The NZCE measurement team has started collecting data from supporters of the initiative. At time of the release of this methodology, the data provided does not yet allow the creation of conclusive industry coefficients. The initiative will continue to collect data to enable the creation of industry coefficients for the next version of this methodology. If your organisation has data to share for any of the nine identified emission source categories, please reach out to us at info@netzerocarbonevents.org.

APPENDIX B: DEVELOPING A PROCESS MAP FOR EVENT EMISSIONS

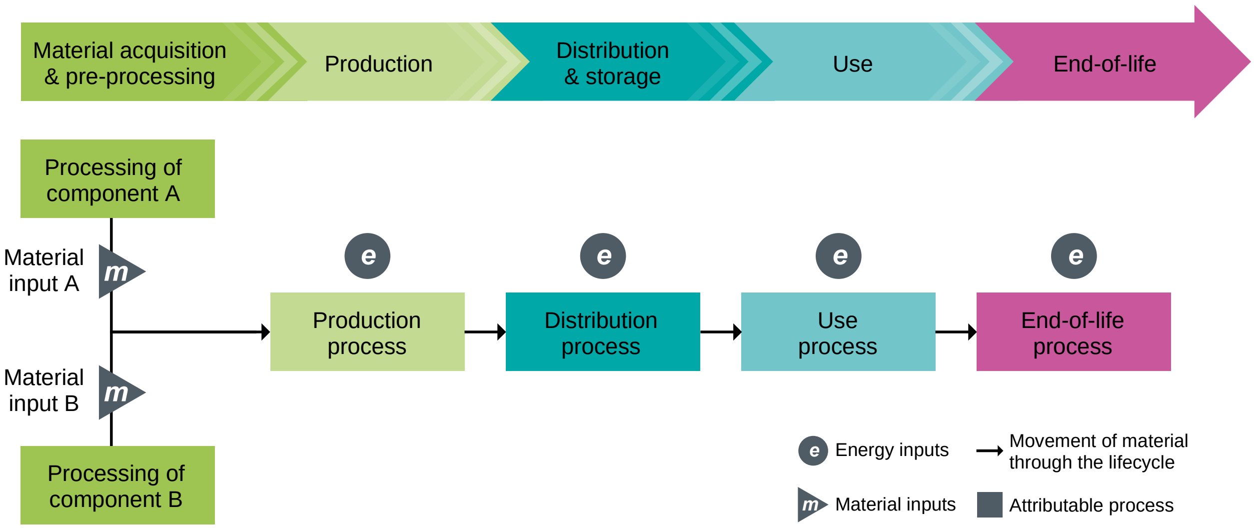
As per the GHG Protocol Product Lifecycle Standard’s recommendation, companies should create a process map for the product they are quantifying. A process map helps in illustrating the services, materials, and energy needed to move a product through its lifecycle. If specific details are considered confidential, a company may create a simplified version of the process map.

Because the delivery of an event is very similar to a product, this methodology also suggests (but does not mandate) that companies should create a “process map” of the event before starting calculations for GHG emissions at the event level because the processes and flows identified in a process map form the basis for the data collection and calculation. Therefore, entities responsible for data collection and calculation should first form or think of a process map of the event in question. Although this may not always be needed if the scale or complexity of the event is straightforward, a process map or some ideation of the in and out flows of the event helps in the quantification of emissions. The following steps may be used to develop a process map:

- Identify the defined life cycle stages of the event from event conceptualisation through to end-of-life.
- Identify the stage when the event is finished and exits the reporting boundary of the entities.
- Identify the input components involved in the upstream processing to create and deliver the event.
- Identify the downstream processes involved in the post event phase of the event.
- Identify the processes involved in the use-phase of the event phase.
- Identify the energy and material flows associates with each process in the upstream, downstream, and use-phase of the event cycle.

Please see below a sample process map for a car as per the GHG Protocol’s Product Lifecycle Standard.

Illustrative steps to develop a process map for a company that produces a final product



Step 1	Identify the defined life cycle stages
Step 2	Identify the studied product leaving the production gate
Step 3	Identify component inputs and upstream processes
Step 4	Identify directly connected energy and material flows
Step 5/6	Identify downstream processes and energy/material flows

APPENDIX C: RESOURCES ANALYSED

During the development of this methodology, different resources (including tools, methodologies, and internal reporting exercises) that calculate emissions in the events industry have been evaluated based on the information either publicly available or provided directly to understand their scope, boundaries, metrics, and assumptions. While all resources provided great help in informing the methodology, the biggest challenge with the existing resources was the difference across their methodologies and calculation assumptions which is what this methodology aims to address, as well as their scope of measurement which in many cases did not cover the full boundary of an event.

Also, many resources had further underlying assumptions, calculation approaches, and coefficients, however many were considered proprietary and confidential, or generally not explained in sufficient detail, and thus not able to incorporate in this methodology. The resources and tools analysed are listed below:

Organisation	Resource
AMEXGBT	Internal Reporting Template
BP	BP Target Neutral Events Calculator
Circular Unity	ImpactAll
Climate Care and Carbon Analytics	Events Carbon Calculator
Creast	Creast
Denver CVB	Denver Event Carbon Footprint Calculator
EEAA	Carbon Footprint Calculator
Emerald	Internal Reporting Template
Eventdecision	Track
Foodsteps	The Food Footprint 100
Global Tourism Plastics Initiative	Plastics Measurement Methodology
Grant Faber	Virtual Events carbon emissions
Greenhouse Gas Protocol and WRI	GHG Emissions Calculation Tool
Greenly	Greenly
Greenview	Hotel Footprinting Tool
Greenview, Tourism declares climate emergency, WTTC, PATA, SHA	Net Zero Methodology for Hotels
IATA	IATA CO2 Connect Calculator
ICAO	ICAO Carbon Emissions Calculator
ICE	SAM
ISLA	TRACE – Measurement Software
Julie's Bicycle	Creative Green Tools
Macau Fair & Trade Association	MICE and Event Carbon Calculator
Maritz	Carbon Footprint Measurement Tool
Meet 4 Impact	Business Events Impactful Framework
Meet Green	MeetGreen Calculator
Meet Green & Clear Current Consulting	Event Food Carbon Calculator
myclimate Event	myclimate Event Calculator

New Economy	Internal Calculations
NZCE	Quick guide to getting started
Oncarbon	Oncarbon
Plan A Acadamy	Carbon Accounting Software
ReFED	Impact Calculator
RX	Show Metrics Template
Singapore Standards Council	Sustainable MICE - Guidelines for waste management
Smart Freight Centre	End-to-End GHG Reporting of Logistics Operations Guidance
South Pole & Green Evenements	Climeet
Sustainable Hospitality Alliance	Hotel Carbon Measurement Initiative (HCMI)
Sustainable Travel International	Travel Carbon Footprint Calculator
Terrapass	Terrapass Events Calculator
Thrust Carbon	Thrust Calculator
Trees4Travel	Trees4Events CO2 Calculator
Trees4Travel	Trees4Travel CO2 Calculator
Trip Zero	TripZero Events
UNEP, UNFCCC, GORD	Green Events Tool (GET)
UNIMEV	Cleo - Event Performance Calculator
University of Colorado Boulder	Right Here, Right Now Global Climate Summit Carbon Calculator
University of Oxford	The Oxford Principles for Net Zero Aligned Carbon Offsetting
WWF	Waste Measurement Methodology

APPENDIX D: FULL EVENT EMISSION CALCULATION EXAMPLES

Examples of hypothetical event's emissions calculations for all 9 categories. Please note that the emissions factors and figures calculated and mentioned are just for illustrative purposes to show general working and approach.

Example 1

Item	Information
Event Type	Workshop
Duration	1 day (7 hours)
Country/City	Singapore
Venue	City Hotel
Total Attendees	100 (30 local, 70 non-local)
Length of stay for non-local attendees	1 night
Event area (m2)	5,000

1. Production and Materials:

Data/Assumptions: The conference used 100 kg of paper.

Emission Factors: Production of paper (0.920 CO_2e/kg)

EF Sources: DEFRA

Emissions: 0.920 *100 = 92 kgCO_2e

2. Freight and Logistics:

Data/Assumptions: The paper and office materials used for the event were delivered by a nearby stationary shop to the hotel which was 5 km away from the hotel. Roundtrip distance was 10km. The shop owner sent a delivery boy on motorcycle to deliver the materials.

Emission Factors: Motorcycle (0.2 kg CO_2e/km).

EF Sources: DEFRA

Emissions: 10*0.2 = 2 kgCO_2e

3. Food and Beverage:

Data/Assumptions: The event organiser catered set box meals for all the 100 attendees. It was recorded that 40 vegan meals and 60 chicken meals were purchased.

Emission Factors: Beans: 0.00147 kgCO_2e/g, Chicken: 0.00697 kgCO_2e/g, Coconut Yogurt: 0.00151 kgCO_2e/g, Cheese: 0.01107 kgCO_2e/g, Rice: 0.00367 kgCO_2e/g, Bell peppers: 0.00138 kgCO_2e/g, Apple: 0.00038 kgCO_2e/g

Vegan meal food items/ingredients: Beans: 50g, Coconut Yogurt: 100g, Rice: 60g, Bell peppers: 140g, Apple: 80g

Chicken meal food items/ingredients: Chicken: 50g, Cheese: 100g, Rice: 60g, Bell peppers: 140g, Apple: 80g

Total emissions per vegan meal ($kgCO_2e$): (50 X 0.00147 + 100 X 0.00151 + 60 X 0.00367 + 140 X 0.00138 + 80 X 0.00038) = 0.6683 $kgCO_2e$

Total emissions per chicken meal ($kgCO_2e$): (50 X 0.00697 + 100 X 0.01107 + 60 X 0.00367 + 140 X 0.00138 + 80 X 0.00038) = 1.8993 $kgCO_2e$

EF Sources: Averages created from Agribalyse, Foodsteps, and The Cool Food Pledge

Emissions: 40 X 0.6683 + 60 X 1.8993 = 26.732 + 113.958 = 140.69 $kgCO_2e$

4. Travel to and from Destination:

Data/Assumptions: Based on the event registration forms, it was found that there were 70 non-local attendees and 30 locals.

- Non-local attendees: The mode of transport for all of them was assumed to be air because Singapore does not have any rail networks or intercountry road transport options. All were assumed to be traveling in economy class. The 70 non-local attendees originated mainly from seven countries.
- Local attendees: All were assumed to be traveling via MRT as the hotel was very conveniently connected to MRT. It was determined based on the data available that a total of roundtrip 100 km was travelled in MRT.

Emission Factors:

- Non-local attendees: IATA tool was used to calculate round trip emissions (without radiative forcing) from city of origin to Singapore. Based on the IATA tool, a total of 12,000 kgCO2e emissions were calculated.
- Local attendees: Singapore Land Transport Authority emission factor for Singapore MRT was used (0.0132 $kgCO_2e$/km)

EF Sources: IATA, Singapore Land Transport Authority

Emissions: 12,000 + 0.0132*100 = 12,000 + 1.32 = 12,001.32 $kgCO_2e$

5. Local Transportation:

Data/Assumptions: For the 70 non-local attendees, roundtrip distance from Changi airport to 2 hotels booked was assumed as 15 km. To determine the mode of transport, assumptions on mode based on section 4.5 were used where it was assumed that 35 attendees took MRT and 35 used a taxi/cab.

Emission Factors: Singapore MRT (0.0132 $kgCO_2e$/km), Regular taxi (0.208 $kgCO_2e$/km)

EF Sources: Singapore Land Transport Authority, DEFRA

Emissions: 0.0132*15*35 + 0.208*15*35 = 6.93 + 109.2 = 116.13 $kgCO_2e$

6. Accommodation:

Data/Assumptions: In addition to the hotel venue where the event was held, the organiser also had a partnership with another hotel nearby where other non-local attendees stayed. In total, there were two hotels where the 70 non-local attendees stayed for a total of 70 room-nights. The organiser asked both the hotels to provide their carbon footprint associated with attendee stays for a total of 70 room nights (35 room-nights each). Based on the HCMI metric of carbon footprint per occupied room on a daily basis, the two hotels calculated their total carbon emissions based on the HCMI coefficient as determined.

Emission Factors: HCMI hotel 1 (100 $kgCO_2e$/occupied room), HCMI hotel 2 (200 $kgCO_2e$/occupied room),

EF Sources: HCMI

Emissions: 100*35 + 200*35 = 3500 + 7000 = 10,500 $kgCO_2e$

7. Energy:

Data/Assumptions: The organiser asked the hotel to provide their carbon footprint associated with energy usage for the meeting space the event utilised (5000 m^2) and the number of hours event was held (seven hours). Based on the HCMI metric of carbon footprint per area of meeting space on an hourly basis, the hotel calculated its total carbon emissions based on the coefficient as determined

Emission Factors: HCMI coefficient as determined by that hotel (0.001120 $kgCO_2e/m^2$/hour)

EF Sources: HCMI

Emissions: 0.001120*7*5000 = 39 $kgCO_2e$

8. Waste:

Data/Assumptions: The event generated 500 kg of waste out of this 70% was recycled waste and 30% was landfilled waste, i.e., 350 kg was recycled and 150 was landfilled.

Emission Factors: DEFRA emission factors used to calculate emissions from recycling and landfilling of different materials.

EF Sources: DEFRA

Emissions: 200 $kgCO_2e$

9. Digital Content and Communication:

Data/Assumptions: Prior to the event, the event organiser had conducted pre-registration exercises online and had also undertaken some videoconference meetings on Zoom for preparation. However, no primary data was available or collected for these.

Emission Factors: Proxy data

EF Sources: Proxy data from a publicly available report for a similar event in a different country

Emissions: 10 $kgCO_2e$

TOTAL EVENT EMISSIONS

= Production and Materials + Freight and Logistics + Food and Beverage + Travel to and from the Destination + Local Transportation + Energy + Accommodation + Waste + Digital Content and Communication

= 92 + 2 + 141 + 12,001 + 116 + 10,500 + 39 + 200 + 10 = 23,101 $kgCO_2e$

Example 2

Item	Information
Event Type	Exhibition
Duration	2 days
Country/City	Valencia, Spain
Venue	Exhibition Centre
Total Attendees	1,000
Length of stay for non-local attendees	1 night[51]
Event area (m2)	8,000
Event Transport provided	No

1. Production and Materials:

Data/Assumptions: The event organiser was able to receive full data about the materials used for the stand builds of the exhibition. The following materials were used:

- Timber-MDF for stand builds – 1500 m^2 = 18900 kg (Used standard conversion of 12.60 kg per m^2)
- Timber-Plywood for stand builds – 2000 m^2 = 14500 kg (Used standard conversion of 7.25 kg/m^2)
- Glass panels – 1200 m^2 = 9360 kg (Used standard conversion of 7.80 kg per m^2)
- Carpet – 2000 m^2 (pile weight 700g/m^2)

Emission Factors: The emission factors used were as below:

- Timber-MDF for stand builds – 0.856 $kgCO_2e/kg$
- Timber-Plywood for stand builds – 0.681 $kgCO_2e/kg$
- Glass panels – 1.667 $kgCO_2e/kg$
- Carpet – 12.7 $kgCO_2e/m2$

EF Sources: The following emission factors sources were used:

- Timber-MDF for stand builds – ICE V3
- Timber-Chipboard for stand builds – ICE V3
- Glass panels – ICE V3
- Carpet – ICE V3

Emissions: The emissions are calculated as below:

- Timber-MDF for stand builds – 1500 m^2 = 18900 kg X 0.856 $kgCO_2e/kg$ = 16178 $kgCO_2e$
- Timber-Plywood for stand builds – 2000 m^2 = 14500 kg X 0.681 $kgCO_2e/kg$ = 9875 $kgCO_2e$

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[51] Assumption made based on section 4.5 for exhibition.

- Glass panels – 1200 m^2 = 9360 kgX 1.667 $kgCO_2e/kg$ = 15603 $kgCO_2e$
- Carpet – 2000 m^2 X 12.7 $kgCO_2e/m^2$ = 25400 $kgCO_2e$
- **Total emissions = 67,056 kgCO2e**

2. Freight and Logistics:

Data/Assumptions: The event organiser partnered with a logistics company to manage door-to-door exhibition logistics including pick-up/collection of exhibits/goods, installation of booths and exhibits, dismantling and on-site assistance. This partnership enabled the organiser to get the distance travelled data for the trucks used in the logistics of their event as follows:

- Total distance travelled – 700 km

Emission Factors:

- Mobile combustion EF – 0.656 $kgCO_2e/km$
- Upstream EF – 0.0948 $kgCO_2e/km$

EF Sources: DEFRA

Emissions:

- Mobile combustion – 0.656 $kgCO_2e/km$ X 700 = 459.2 $kgCO_2e$
- Upstream – 0.0948 $kgCO_2e/km$ X 700 = 66.36 $kgCO_2e$
- **Total emissions = 525.56 $kgCO_2e$**

3. Food and Beverage:

Data/Assumptions: The event organiser held an evening dinner and cocktails for some of the VIP guests and sponsors at a nearby hotel (total of 50 guests). The hotel was responsible for catering all the food and drinks. The organiser could not get the data based on ingredients and therefore had to rely on overall weight data provided by the hotel to calculate the associated emissions. According to the hotel, the average meal weighed 500g, and the guests drank on average 1l (1kg) of beverages.

Emission Factors: Overall F&B weight-based emission factor (3.7 $kgCO_2e/kg$)

EF Sources: DEFRA

Emissions: 3.7 $kgCO_2e$ X 0.5kg X 50 + 3.7 $kgCO_2e$ X 1 = 96.2 $kgCO_2e$

4. Travel to and from destination:

Data/Assumptions: Despite attendee travel being outside the scope of their organisational footprint, the event organiser undertook great strides to ensure it captured the origin information of the attendees. This was captured using registration forms and digital platforms. As a result, out of 1,000 attendees, the organiser was able to get origin information for around 800 attendees in which it was found that 300 were “local” and 500 were “non-local” attendees. For the remaining 200, there was no information at all.

- Non-local attendees with known data: Based on the information on the 500 “non-local” attendee’s origin, the organiser calculated the round-trip distance between the origin and venue and then using the decision tree in Section 4.4; the split was applied to get the mode of travel. Once, the distance and mode were determined, appropriate emissions factors were applied to get the emissions of the travel from the attendees whose origin information was known. The emissions calculated for the 500 “non-local” attendees were 10,000 $kgCO_2e$.

- Local attendees with known data: Based on the 300 “local” attendees with known data of their origin address, the organiser calculated the round-trip distance between the origin and venue and using the decision tree in section 4.5; the split was applied to get the mode of transport. Once, the distance and mode were determined, appropriate emissions factors were applied to get the emissions of the travel from the attendees whose origin information was known. The emissions calculated for the 300 “local” attendees were 5,000 $kgCO_2e$.

- Attendees with unknown data: For the 200 attendees without any data on their travel, based on the decision tree in section 4.4, it was assumed that 25% are “local” and 75% are “non-local” i.e., 50 attendees are “local” and 150 are “non-local.”. An extrapolation was done based on the emissions of the “non-local” and “local” attendees with known data as below:
  - Extrapolation of “non-local” attendees –
    - Emissions of the 500 “non-local” attendees with known data = 10,000 $kgCO_2e$
    - Average emissions of the “non-local” attendees = 10,000 / 500 = 20 $kgCO_2e$/attendee
    - Emissions for the 150 “non-local” attendees without data = 20 X 150 = *3,000 $kgCO_2e$*
  - Extrapolation of “local” attendees –
    - Emissions of the 50 “local” attendees with known data = 5,000 $kgCO_2e$
    - Average emissions of the “local” attendees = 5,000 / 300 = 16.7 $kgCO_2e$/attendee
    - Emissions for the 50 “local” attendees without data = 16.7 X 50 = 833 $kgCO_2e$

Emission Factors: Various DEFRA factors were used to calculate mobile combustion emissions related to travel based on distance and mode of transport (with radiative forcing for aviation). Note that the upstream WTT emissions related to the fuels used in vehicles was not included.

EF Sources: DEFRA

Emissions: Non-local attendees with known data + Local attendees with known data + Attendees with unknown data = 10,000 + 5,000 + 3,000 + 833 = 18,833 $kgCO_2e$

5. Local Transportation:

Data/Assumptions:

It was assumed that attendees were involved in following location transportation activities:

- Hotel to and from the venue – It was assumed that average of 10 km round trip distance was travelled by each “non-local” attendee.

- Airport and Railway to and from the Hotel – It was assumed that average of 15 km round trip distance was travelled by each “non-local” attendee.

- It was assumed that NO “local” attendees were involved in any local transportation activities and did not stay in hotels

Therefore, the total distance travelled =

- Hotel to and from the venue – 10 X 650 = 6,500 km

- Airport and Railway to and from the Hotel – 15 X 650 = 9,750 km

- Total distance = 6,500 + 9,750 = 16,250 km

The total distance above was then multiplied by an appropriate emission factor to convert to emissions. The emission determined were 3,000 $kgCO_2e$.

Emission Factors: DEFRA factors were used to calculate mobile combustion emissions related to travel based on distance and mode of transport.

EF Sources: DEFRA

Emissions: 3,000 $kgCO_2e$

6. Accommodation:

Data/Assumptions: It was not possible to know the hotels and the number of nights for each of the 650 “non-local” attendees. Therefore, as per the assumptions on room night provided in section 4.6, it was assumed that all attendees stayed one night for the event. Therefore, the total room nights for the event were 650 room-nights.

Emission Factors: HFT was used to get the average emissions for 650 room nights in Spain.

EF Sources: HFT

Emissions: 7,000 kgCO_2e

7. Energy:

Data/Assumptions: The organiser asked the venue to provide the energy data for their event. The organiser was able to obtain the monthly energy consumption data from the venue. The data provided by the venue was provided for its two main halls as totals. In order to get the energy consumption for its apportioned event, the following steps were taken:

- Apportion the total consumption for the used area and number of days of events:
  - The total venue energy data for the month in which the event was held was 500,000 kwh.
  - Total area of the two halls of the venue = 12,000 m^2
  - Total area used by the organiser’s event = 8,000 m^2
  - Number of days of event = 2 days
  - (Used area/total venue area) X (no. of days of event/total days in the month venue reported data) X total venue energy
  - (8,000/12,000) X (2/30) X 500,000 kwh
  - 22,222 kwh

Emission Factors: 0.156 kgCO_2e/kwh

EF Sources: Grid factor for the Spain using EEA database.

Emissions: 0.156 X 22,222 = 3,466 kgCO_2e

8. Waste:

Data/Assumptions: The event generated 30,000 kg of waste. However, the organiser did not know how much was landfilled vs. recycled. Therefore, based on industry averages, a split of 70% landfilled and 30% recycled was applied i.e., 21,000 kg was landfilled and 9,000 was recycled. In addition, the venue provided monthly wastewater discharge value to the organiser. The organiser apportioned the monthly wastewater data to the number of days of its event as 2,000 m^3.

Emission Factors: DEFRA emission factors used to calculate emissions from recycling and landfilling of different materials and also from wastewater discharge.

EF Sources: DEFRA

Emissions: 2,544 kgCO_2e

9. Digital Content and Communication:

Data/Assumptions: The following data were available with the organiser to determine the emissions from digital content and communication:

- Website visits – Based on the website hosting data, it was recorded that the event website was accessed 1500 times. Therefore, the organiser used Website Carbon to get the average carbon coefficient per visit which was around 0.38 gCO_2e per visit. For 1500 times, the emissions were 0.57 kgCO_2e.

- Search Engine Queries – For the preparation of event, the organiser had run various search engine queries for finding vendors and sponsors. An estimated number of search engine queries was 4,000. Based on section 4.9, the average emissions per query was 0.0002 $kgCO_2e$. Therefore, the total emissions for 4,000 queries are 0.8 $kgCO_2e$.
- Emails – Around 2,500 emails were sent to sponsors, exhibitors, and attendees before the event. Based on the emissions range provided in section 4.9 for emails, 13 gCO_2e per email was used as a coefficient. Therefore, the total emissions is 32.5 $kgCO_2e$.

Emission Factors: As referenced above and in section 4.9

EF Sources: As referenced above and in section 4.9

Emissions: 0.57 + 0.8 + 32.5 = 33.87 $kgCO_2e$

TOTAL EVENT EMISSIONS

= Production and Materials + Freight and Logistics + Food and Beverage + Travel to and from the Destination + Local Transportation + Energy + Accommodation + Waste + Digital content and Communication

= 67,056 + 525.56 + 96.2 + 18,833 + 3,000 + 7,000 + 3,466 + 2,544 + 33.87

= 99854.63 kgCO2e

APPENDIX E: GUIDANCE ON INCLUDING RADIATIVE FORCING MULTIPLIER

For instances where the applicable travel emission factor does not yet include a radiative forcing multiplier, you can follow the below steps to add the multiplier using the hypothetical example shown:

1. Get the emission factor for each individual GHG without RF multiplier. Emission factor for each individual GHG is needed as the RF multiplier should only **be applied to the CO_2 factor.**
2. Convert as applicable based on the preferred unit system. In the example below, the conversion shown is for **kg/km** format.
3. Multiply with the Global Warming Potentials (GWP) so that the $kgCH_4$/km and kgN_2O/km are in $kgCO_2e$ format. (Assume GWP of CH_4 = **25** and GWP of N_2O = **298**)
4. Multiply step 3 with the total distance (assume 1,000 km)
5. Multiply step 4 above for **CO_2 only** with RF multiplier (Assume **1.9**). Usually based on research the RF multiplier ranges from 1.9 to 3.4[52].
6. Finalize the calculations and sum up the values to get the total emissions.

Step	Item	CO_2	CH_4	N_2O
1	Air travel EF without RF (Medium haul)	0.159 ($kgCO_2$/km)	0.0004 (gCH_4/km)	0.0022 (gN_2O/km)
2	Convert to kg/km	0.159 ($kgCO_2e$/km) = 0.159 ($kgCO_2$/km)	0.0004 / 1000 = 4*10^-6 ($kgCH_4$/km)	0.0022 / 1000 = 2.2 * 10^-6 (kgN_2O/km)
3	Multiply with GWP	0.159 X 1	4*10^-6 X **25**	2.2 * 10^-6 X **298**
4	Multiply with total distance	0.159 X 1 X 1,000	4*10^-6 X 1,000 X **25**	2.2 * 10^-6 X 1,000 X **298**
5	Emissions calculation with RF	0.159 X 1,000 X **1.9**	4*10^-6 X 1,000 X **25**	2.2 * 10^-6 X 1,000 X **298**
6	Totals ($kgCO_2e$)	302.1	0.1	0.6556
6	**Total ($kgCO_2e$)**		**302.86**	

[52] https://unhsimap.org/cmap/resources/air-travel

APPENDIX F: EMISSION FACTOR SOURCES

The methodology recognises that several different sources of emission factors are available online for the same emission sources. In many cases, there are no "right" sources, but consistency and transparency are needed in selecting the emission factors, as well as in reporting emissions later. Choosing the emission factor that is most appropriate is important to quantifying emissions as accurately and representatively as possible. The following table provides an overview of all emission factor sources mentioned throughout this document.

Please refer to the individual document sections of each emission source category outlined in the table below to learn more about which sources NZCE recommends most. Many emission factor sources apply for multiple emission source categories. **Please also note that any emission factor sources mandated by national or local regulation in your organisation's region will take priority over our recommendation hierarchy.**

The links provided for each emission factor source in the table below are current as of the publication of this methodology. Databases might be updated, and links changed as a result. If available, updated databases should be used.

Emission Source Category	Emission Factor Source	Accessibility
Production and Materials, Freight & Logistics, Food & Beverage, Travel to and from the Destination, Local transportation, Energy, Accommodation, Waste	Department for Environment Food & Rural Affairs (DEFRA) – United Kingdom: Greenhouse gas reporting: conversion factors 2022	Free
Production and Materials, Freight & Logistics, Travel to and from the Destination, Local Transportation, Energy, Waste	Agency for Ecological Transition (ADEME) - France: Base Carbone v.17.0	Free
Production and Materials, Accommodation, Waste	Ecoinvent v.3.9.1	Paid
Production and Materials	The British Standards Institution (BSI): PAS 2050:2011 methodology	Paid
Production and Materials	Circular Economy and University of Bath: Inventory of Carbon and Energy (ICE) Database Version 3.0	Free
Freight & Logistics, Travel to and from the Destination, Local Transportation, Energy	Energy Information Administration (EIA) – United States of America: Carbon Dioxide Emissions Coefficients by Fuel	Free
Freight & Logistics	Global Logistics Emissions Council Default Fuel Efficiency and CO2e Intensity Factors	Free
Freight & Logistics, Travel to and from the Destination, Local Transportation, Energy, Waste	Environmental Protection Agency (EPA) – United States of America: GHG Emission Factors Hub	Free
Freight & Logistics, Travel to and from the Destination	International Civil Aviation Organization (ICAO): Carbon Emissions Calculator	Free
Freight & Logistics, Travel to and from the Destination, Local transportation, Energy	International Energy Agency (IEA): Emissions Factors 2022	Paid
Freight & Logistics	Clean Cargo: 2020 Global Container Shipping Trade Lane Emissions Factors	Free

Freight & Logistics	Environmental Protection Agency (EPA) – United States of America: SmartWay Sustainability Accounting and Reporting	Free after sign-up
Food & Beverage	Agribalyse - France: 3.1.1	Free
Food & Beverage	Foodsteps – United Kingdom: The Food Footprint 100 report	Free
Food & Beverage	The Cool Food Pledge Calculator	Free
Food & Beverage	Temasek - Singapore: Environmental Impact of Key Food Items in Singapore	Free
Food & Beverage, Waste	Environmental Protection Agency (EPA) – United States of America: Supply Chain Greenhouse Gas Emission Factors v1.2 by NAICS-6	Free
Travel to and from the Destination	International Air Transport Association (IATA): CO2 Connect Calculator	Free
Travel to and from the Destination	International Air Transport Association (IATA): CO2 Connect Calculator – Corporate Travel Package and other subscription options	Paid
Energy	World Resources Institute (WRI): GHG Protocol tool for stationary combustion v.4.1	Free
Energy	Association of Issuing Bodies (AIB): European Residual Mix	Free
Energy	World Meteorological Organization (WMO) Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project—Report	Free
Accommodation	Greenview: Hotel Footprinting Tool	Free
Digital Content & Communication	Grant Faber (2021): A framework to estimate emissions from virtual conferences, International Journal of Environmental Studies	Paid
Digital Content & Communication	Website Carbon Calculator	Free
Digital Content & Communication	The Carbon Cost of an Email: Update!	Free
Digital Content & Communication	Climatiq	Free
Digital Content & Communication	Schneider Electric’s Data Center Carbon Footprint Calculator	Free
Digital Content & Communication	International Energy Agency (IEA): The carbon footprint of streaming video: fact-checking the headlines	Free

APPENDIX G: GLOSSARY OF TERMS

Term	Description
Apportionment	Apportionment in this methodology refers to an inherent approach to any carbon calculation methodologies. This approach becomes relevant when products or services and resulting emissions are shared between multiple stakeholders, for example, in the case of two events taking place in parallel in the same exhibition hall where energy cannot be measured separately or when two events share trucks for the logistics connected to their events. In these cases, emissions need to be attributed to each event/ stakeholder and determining assumptions of apportionment becomes necessary.
Attendee	Attendees are generally all stakeholders that travel to and participate in an event. This can include organiser staff, contractor staff, exhibitor staff, customers, visitors etc. Depending on the emission source in questions, organisations should report transparently, which attendee groups they are including in their calculations.
Coefficients/ Proxy data	Coefficients and proxy data are essential tools for emissions measurement and estimation, especially when direct measurements are impractical or historical data is limited. These data points are usually based on studies and analysis of available related data. Coefficients/ Proxy data can be used in place of primary data if not available. However, especially for emissions measurement, primary data is preferred and should be used whenever possible.
Cradle-to-grave	Cradle to grave is a life cycle assessment approach that considers all stages of a product's life, from the extraction of raw materials to its disposal. This includes the following stages: Extraction of raw materials, manufacturing, transportation, use, and disposal. Another life cycle assessment (LCA) approach is Cradle to shelf. This approach considers all stages of a product's life from the extraction of raw materials to its delivery to the customer. This includes the following stages: Extraction of raw materials, manufacturing, transportation, and retail. Cradle to grave is a more comprehensive approach to LCA, as it considers the full impact of a product on the environment. However, it can be more difficult to implement, as it requires data on the use and disposal of products, which can be difficult to obtain.
Embodied carbon	Embodied carbon—also known as embodied greenhouse gas (GHG) emissions—refers to the amount of GHG emissions associated with upstream stages of a product’s life, including extraction, production, transport, and manufacturing.
Emission factors	Emission factors (EF) are an important tool for quantifying and analysing the release of various pollutants and greenhouse gases into the atmosphere. Emission factors are expressed in values that represent the amount of a specific pollutant or greenhouse gas emitted per unit of a particular activity or process. Accordingly, emission factors are usually multiplied with the activity or process in question to calculate their environmental impact. This methodology refers to emission factors in the unit of CO_2-equivalent (CO_2e) whenever discussing emission factors.
Exhibitors	Both the main exhibitors and the co-exhibitors are considered as “direct” exhibitors. The main exhibitors are those bodies contracting directly with the organiser. The co-exhibitors are those companies present on a main exhibitor's stand, with their own staff and their own products and/or services. They must be clearly identified via several means, e.g., mentioned on the application form of the main exhibitor or declared by an official coordinating

	body, or in the exhibition catalogue forms. In the case of a collective participation, the space must be rented and paid for by the exhibitor organising the collective participation. The area is shared by several participants who are considered to be co-exhibitors if they occupy their own area, appear under their own name and present their own products/services by their own staff. If each of these conditions is not fulfilled, they are considered as “represented companies” (“indirect” exhibitors) and may not be counted in the exhibitor tally.
Extrapolation	To extrapolate data means to estimate or predict values or trends for a specific data point beyond the range of the available data. Various techniques can be used for extrapolation.
Life cycle assessment	Life cycle assessments (LCAs) are a systematic approach to assessing the environmental impacts of a product or service throughout its life cycle. Depending on the approach chosen (examples provided in the description for cradle-to-grave) a life cycle assessment can include the environmental impacts connected to the extraction of raw materials, the manufacturing and transportation of the product, the use and maintenance of the product, and the disposal of the product at the end of its life.
Like for like comparison	A "like-for-like comparison" in the context of emissions measurement refers to a method of comparing emissions data for different scenarios, activities, or entities while ensuring that the comparison is fair and accurate. In a like-for-like comparison, key variables that can influence emissions are held constant or are kept as similar as possible between the scenarios being compared. An example for this can be that an event organiser compares their calculated emissions for specific years only including the same emission sources. If a new emission source is added based on the fact that research on that emission source has improved, the baseline year might need to be recalculated including that emission source as well. This ensures that differences in emissions are primarily due to the specific factor under investigation.
Local Attendee	This methodology defines local attendees as those attendees that reside in the same city the event is held in. Non-local attendees include all other attendees. These attendee groups are defined separately specifically for the travel related emission source categories since local attendees have access to different transport modes than non-local attendees.
Net zero	Net zero refers to a balance between man-made greenhouse gas (GHG) emissions and their removal from the atmosphere. To achieve this balance, GHG emissions must be reduced, and the non-avoided ones must be compensated or “neutralised” through the use of long-term carbon capture solutions.
Radiative forcing	Radiative forcing, in the context of flight emissions, refers to the additional global warming impacts resulting from non-CO_2 emissions, i.e., other greenhouse gases, contrails and aviation-induced cirrus clouds. The impact of radiative forcing can be calculated by adding a radiative forcing factor to flight emission calculations. However, the scientific evidence, although strengthening, still remains nascent and uncertain. Accordingly, research on which factor to apply has not been conclusive. However, the impact of radiative forcing on overall flight emissions is considered to be significant. You can find more information about the NZCE approach to radiative forcing on p. 32 of this methodology.
Represented Companies	Represented companies are those organisations/companies not present with their own staff, and whose products or services are present on a main exhibitor's or co-exhibitor's stand.

Scope 1, 2, and 3	Based on the GHG Protocol: Scope 1 emissions are direct emissions from sources that are owned or controlled by the company. This includes emissions from fuel combustion, industrial processes, and fugitive emissions. Scope 2 emissions are indirect emissions from the generation of purchased electricity, heat, or steam. Scope 3 emissions are all other indirect emissions that occur in the company's value chain, including both upstream and downstream emissions. This includes emissions from the extraction and production of purchased materials and fuels, transportation-related activities, business travel, and waste disposal.
Total Gross Exhibition Space	This is the total space provided by the venue operator for use by the organisers or, the total space used by the fair, including circulation. Catering areas, offices, storage, etc. are excluded. This floor area is relevant for venue reporting.
Total Net Exhibition Space	Total floor space - indoors and outdoors - occupied by exhibitors. This is also called "contracted space" and may include both paid and unpaid space. It also includes space allocated to special shows having a direct relation to the theme of the exhibition. This floor area is relevant for organiser reporting.
Venue	All events: Event venues are places where an event can be held. Venues are extremely diverse based on the diversity of event types offered in the events industry. As such, venues can include convention centres, conference centres, hotels, resorts, breweries and wineries, restaurants, bars and nightclubs, golf courses, social clubs and lounges, community centres, museums, aquariums, and zoos, art galleries, historical and cultural estates, theatres, colleges and universities, retreat centres, cruise ships, stadiums, and more53. Exhibition specific (Source: UFI): Any public assembly premises with an indoor Exhibition Space and that hold various types of exhibitions, trade fairs or consumer/public shows on a regular basis. The premises may be purpose-built exhibition centre space or other premises including Exhibition Space (e.g., hotels, arenas, sport venues, and amusement fairgrounds)
Visitor	A visitor is a person who, on any official open day and hour, enters the physical, event with an access document or enters the digital event via a unique identifier and who is representative of the market audience expected by the organisers and exhibitors. The visitor is counted only once for the entire duration of the fair, regardless of the number of visits. Excluded from the calculation of "visits" to an event are: staff of the exhibition venue and organiser, staff working for service providers, staff of exhibiting companies/organisations, speakers during the event, media representatives.
Well-to-Tank emissions	"Well-to-Tank" (WTT) emissions refer to the greenhouse gas emissions associated with the entire life cycle of a fuel or energy source. This includes the extraction or production phase, the processing and refining stage, the transportation and distribution phase, and the end-use phase.

[53] Cvent (2022). 18 Types of Venues for Every Type of Event.

APPENDIX H: LIST OF ACRONYMS

Acronym	Full Term
ADEME	Agency for Ecological Transition - France
AIB	Association of Issuing Bodies
B2B	Business to Business
BSI	The British Standards Institution
CCF	Cloud Carbon Footprint
CHSB	Cornell Hotel Sustainability Benchmarking Index
CO2e	Carbon Dioxide Equivalent
COP	Conference of the Parties
DEFRA	Department for Environment Food & Rural Affairs – United Kingdom
EACs	Energy Attribute Certificates
EF	Emission Factor
EIA	Energy Information Administration – United States of America
EPA	Environmental Protection Agency – United States of America
EPD	Environment Production Declaration
F&B	Food & Beverage
GHG	Greenhouse Gas
GLEC	Global Logistics Emissions Council
GPS	Global Positioning System
GTPI	Global Tourism Plastics Initiative
GWP	Global Warming Potential
HCMI	Hotel Carbon Measurement Initiative
HFT	Hotel Footprinting Tool
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICE	Inventory of Carbon and Energy
ICT	Information and Communications Technology
IEA	International Energy Agency
IOC	International Olympic Committee
IPCC AR 4	Intergovernmental Panel on Climate Change Fourth Assessment Report
LCA	Life Cycle Assessment
MSW	Municipal Solid Waste
NAICS	North American Industry Classification System
NZCE	Net Zero Carbon Events
PAS	Publicly Available Specification

PCAF	Partnership for Carbon Accounting Financials
PUE	Power Usage Effectiveness
RECs	Renewable Energy Certificates
RF	Radiative Forcing
SBTi	Science Based Targets initiative
WMO	World Meteorological Organization
WRI	World Resources Institute
WTT	Well-to-tank